Financial policy elements of developing a forward-looking cost base for heavy vehicle charging

Report for the Commonwealth Department of Infrastructure and Regional Development

14 June 2017

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Executive summary

The Heavy Vehicle Road Reform (HVRR) Road Map aims to create a market for the provision and use of heavy vehicle (HV) infrastructure, with clear links between the needs of users, the charges they pay and the services they receive. The HVRR Road Map was endorsed by the Transport and Infrastructure Council (the Council) in May 2015.

A Forward Looking (lifecycle) Cost Base (FLCB) for HV charges is an important element of phase two of the HVRR Road Map. The successful implementation of a FLCB would support future HVRR objectives, such as regulatory and funding reform, and full market reform.

In November 2016, the Council agreed to the development of a prototype working model for a FLCB based on the Building Blocks Model (BBM) to underpin future HV charge calculations, as part of a package of measures to support phase two of the HVRR. Moving to a FLCB would be a significant change, since HV charges are currently set under the PAYGO approach by establishing a cost base using a seven-year historical average, with the HV portion of total roads costs separated out for recovery through HV charges.

The Commonwealth, through the Department of Infrastructure and Regional Development (DIRD), asked Farrier Swier Consulting (FSC) to: assess the advantages and disadvantages of using a BBM to establish a FLCB to underpin HV charging; provide advice on specific aspects of the BBM application to inform development of a prototype model; and provide advice on other related matters.

Nature and merits of building blocks model

The BBM is a forward-looking method for determining the allowed revenues over a forthcoming period that reflect the regulated business's forecast costs of providing its services. The BBM would calculate the allowed revenues by summing the return on capital, depreciation, operating expenditure, and potentially, other building blocks.

The BBM is a flexible and straight-forward concept that is based on accounting principles and is widely used for setting utility revenues and charges. If properly applied, it can ensure a road service provider will have a reasonable opportunity to recover at least the costs of providing its services while providing assurance to users that HV charges are not too high. Its flexibility means it can: 1) evolve over time to include more sophisticated arrangements, including incentives to promote efficiency or innovation, and 2) support various policy objectives and accommodate changes in them over time. A further benefit of the BBM is that it is compatible with private road funding.

The BBM has some potential limitations. It can be information-intensive and relies on information held by the regulated service provider, which can give the provider an advantage in its dealings with the regulator and users. The BBM can also result in detailed debates about methodological issues that may not be proportional to the ultimate benefits to users, and on which they may find it difficult to engage. These potential



limitations highlight the need to carefully design the regulatory framework and to use principles of best practice regulation to ensure the regime is fit for purpose.

Scenarios considered

This report adopts the following distinction between price regulation and economic adopted by the federal, state and territory governments:

• **Price regulation** | is a form of regulation that calculates a revenue amount based on forecasts of the providers' forward-looking costs of providing HV road services, which in turn is used to calculate the level of each parameter of the HV charges, taking into account other information, such as forecast demand.

How forecast and actual revenues received by a road service provider that are linked to provision of HV services will be determined in practice will depend on (1) the details of any new national HV charging and revenue allocation arrangements, and (2) state and territory government budget and financial management arrangements. These matters are our scope for this report. For the purpose of this report, we make the simplifying assumption that under price regulation, the notional revenue forecast produced by the BBM used to determine HV charges is also used to set a road service provider's forecast revenue as this is consistent with our understanding of one of the goals of HV road reform.

• Economic regulation | is a form of regulation that applies the BBM to determine annual revenue requirements (ARRs) received by the service provider and calculates these based on prudent and efficient benchmark costs, and agreed levels of service. It may also incorporate strengthened incentives to promote efficiency.

We also recognise that road service providers are currently structured as government departments although they may in the future evolve into statutory authorities or government owned corporations (GOCs).

Importantly, we have assumed that jurisdictions will want to constrain the rate of change of the price path faced by users for at least a transitional period so that it is reasonably comparable with what would have applied if PAYGO continued.

Our analysis found that the most appropriate form of BBM will vary depending on which of the following three future scenarios apply to HV services:

- 1. price regulation of a government department;
- 2. economic regulation of a government department; and
- 3. economic regulation of a statutory authority or GOC.

Our recommended form of BBM for each scenario is illustrated in Figure 1 and explained below.





Figure 1 - Overview of proposed specific form of BBM by scenario

Scenario I – Price regulation of government departments

This scenario reflects the first stage of reform agreed by jurisdictions, which is to apply the BBM using price regulation to road service providers organised as government departments. We recommend:

- basing the initial regulatory asset base (RAB) on the line-in-the-sand approach to be consistent with a targeted transitional price path and cost of capital. The projected RAB would be based on the operation of the RAB roll forward model;
- the cost of capital would be based on the government cost of borrowing; or as an alternative it could be a lower cost of capital to assist in achieving the targeted transition price path;
- the depreciation allowance (as under all scenarios) would reflect real straight-line depreciation, based on the value of RAB and the remaining lives of assets; and
- the opex (and capex) expenditure allowance would be based on the road service provider's forecast expenditure.



There may be a concern that, if the line-in-the-sand approach results in a positive initial RAB, road users may be paying again for capex for which they have already paid under PAYGO. We have identified an alternative approach that could address this concern – using a zero opening RAB and bringing forward revenue to achieve a targeted transition price path. The need for this alternative approach will depend on the extent of users' concerns and will involve political judgement.

Consistent with the intent of price regulation, there would be no focus under this scenario on defining efficient costs, regulating service levels or introducing incentives schemes.

A control mechanism would not apply. There could be a true-up mechanism to correct for differences between actual revenue and expenditure, which could be paid either by road users and/or government. This reflects the fact that a government department has no balance sheet and therefore a limited capacity to bear financial risks.

There could be a short control period of, say, one or two years.

Scenario 2 – Economic regulation of government departments

A possible next step would be to apply economic regulation, rather than price regulation, while continuing to structure road service providers as government departments. This scenario has been included for completeness. It is possible jurisdictions might determine that economic regulation of a government department is not appropriate, and that it would be preferable to move directly to scenario 3.

This would involve changing scenario 1 as follows:

- the cost of capital would be set to reflect the efficient financing costs of a benchmark efficient entity. We suggest for simplicity basing the benchmark cost of capital on a pre-tax WACC approach, which means that there would be no corporate tax building block;
- opex and capex forecasts would be set to reflect the expenditure required by a benchmark efficient entity to meet the defined service levels rather than the road service provider's actual expenditure, as under Scenario 1; and
- a control mechanism would be introduced, which we recommend be a revenue cap. This would require a new building block to account for any correction amount for under or over recoveries against the revenue caps from year-to-year.

There would continue to be a true-up mechanism to address differences between actual revenue and expenditure, which could be paid either by road users and/or government.

Scenario 3 - Economic regulation of government corporations

This scenario reflects a road service provider being restructured in a more 'business-like' manner (e.g. a statutory authority or GOC). It would now have a balance sheet, and some greater degree of independence from government to access debt financing which

would enable it to bear financial risks (including risks allocated through the design of economic regulation) arising from variations between the forecast revenues and actual expenditure.

This scenario could evolve directly from Scenario 1 or Scenario 2. The main changes from Scenario 2 are as follows:

- the true-up mechanism would no longer be required, given the road service provider's ability to bear financial risk;
- there could potentially be more sophisticated mechanisms for managing cost risks, such as cost pass through and contingent project mechanisms; and
- there would be options to introduce incentive schemes that put revenue at risk and there could be a longer control period, perhaps up to five years.

Next steps

We expect that, at a minimum, jurisdictions will want to develop a prototype model in the second stage of work on the FLCB, consistent with Scenario 1. We consider that it will be beneficial to develop and apply this model to one or more road service providers using realistic information, rather than to undertake purely conceptual analysis and model. Section 11 sets out details of proposed next steps for discussion. A strategic decision is required about whether jurisdictions would also want to analyze the BBM for scenarios 2 and 3, in particular the price implications of moving from a government cost of borrowing to a benchmark commercial cost of capital.



Glossary

Economic regulation terms ¹			
annual revenue requirement (ARR)	An amount representing revenue for a road service provider for each regulatory year of a control period, calculated by summing each building block component.		
building blocks model (BBM)	A method used to determine the ARR for a service provider and which, if properly applied, would enable it to recover actual (under price regulation) or benchmark prudent and efficient (under economic regulation) costs but would not result in excessive monopolistic charging.		
building block components	The components of the BBM that together determine the ARR. These components will vary depending on the application of the BBM but will always include:		
	1. return on capital;		
	2. depreciation (or return of capital); and		
	3. operating expenditure (opex).		
	Other potential building block components include:		
	4. tax allowance; and		
	5. revenue adjustments.		
charging ² methodology	The methodology used to set HV charges to recover the ARR (for example mass distance locational pricing).		
control mechanism	The mathematical control on how the road service provider can recover it ARR through its HV charges. Potential control mechanisms include a revenue cap and price cap, of which a weighted average price cap (WAPC) is a variant. This is only applicable under economic regulation.		
control period	The period of time over which the control mechanism applies and also the period of time for which ARRs are determined using the BBM. This period determines the frequency with which prices and revenues are realigned to updated estimates for the FLCB.		

¹ Source: Farrier Swier Consulting

 $^{^{2}}$ The charging methodology is outside the scope of this report.



correction factor	A positive or negative adjustment made under a revenue cap control mechanism for any under or over-recovery of revenue against an ARR in a preceding year.		
cost of capital	See rate of return. These two terms are used inter-changeably in this report.		
depreciation building block	The component of the BBM that allows the service provider to recover its investment over the economic lives of its assets that are used to provide its services.		
deprival	An approach to setting the initial regulatory asset base.		
value approach	Deprival value represents the opportunity cost incurred if an entity were to be deprived of the service potential, or the future economic benefit, of the assets. The deprival value is typically defined as being the lesser of:		
	1. optimised depreciated replacement cost (ODRC); and		
	2. the economic value of the asset which is calculated as the maximum of:		
	a) the net present value of the future cash flows; and		
	b) the net realisable value from selling the assets for their scrap value.		
economic regulation	A form of regulation that applies the BBM to determine ARRs that reflect the prudent and efficient costs, and agreed levels of service. It may also incorporate strengthened incentives to promote efficiency.		
heavy vehicle (HV) services	Services provided to HV users in exchange for paying HV charges.		
heavy vehicle (HV) charges	Charges paid by HV users that are calculated based on the ARR, the application of the control mechanism (under economic regulation) and the charging methodology.		
heavy vehicle (HV) revenue model	A specific model, such as a BBM, for calculating the ARR to recover the cost attributed to providing HV services.		
incentive regulation	A type of economic regulation that uses rewards and penalties to incentivize a road service provider to achieve desired goals, such as to minimize costs and maintain service levels.		
initial regulatory	The value of the RAB determined at the time of implementing the BBM.		



asset base (RAB)			
line-in-the-	An approach to setting the initial RAB.		
sand approach	The initial value of the RAB is set to be consistent with maintaining the prevailing prices, revenues or returns into the future. If used to maintain the prevailing level of prices or revenues, then it is consistent with using the 'economic value limb' of the Deprival Value method.		
opening RAB	The value of the RAB at the beginning of a control period.		
opex building block	The component of the BBM that allows the road service provider to recover the operating, maintenance and other non-capital costs that it incurs in providing its services.		
optimised	An approach to setting the initial regulatory asset base.		
depreciated replacement cost (ODRC) approach	In Australian regulatory practice, it is calculated by (1) estimating the cost of replacing the existing asset with an optimally configured (and sized) new asset that is constructed using modern engineering equivalent materials (the optimised replacement cost (ORC)); and (2) account for differences in the service potential and costs of operating the existing asset and the optimised asset by 'depreciating' the ORC on either a straight-line basis or on a net present value basis.		
price regulation	A form of regulation that applies the BBM to determine ARRs that enable the road service provider to recover its forecast actual costs.		
rate of return (or cost of capital)	The rate of return is selected to appropriately compensate the road service provider for the cost of financing investment in the assets used to provide HV services.		
return on capital building block	The component of the BBM that allows a road service provider to finance its investment in the assets that it uses to provide its services. It is calculated by applying the allowed cost of capital to the value of the RAB relevant to the services being provided.		
revenue adjustments	The component of the BBM that adjusts a service provider's ARR, including for matters such as the application of the control mechanism and incentive schemes. This is not an essential component of the BBM.		
side constraint	A limit on any increase in an individual charge, or charging parameter, from one year to the next.		
tax building block	The component of the BBM that, under a post-tax framework, allows a road service provider to recover the costs associated with the estimated corporate income tax payable. This is not included in the BBM if a pre-tax framework is used.		



true-up (for revenue and expenditure)	A mechanism to ensure the outturn (actual) revenue is equal to outturn (actual) expenditure. This is only relevant under price regulation.
weighted average cost of capital (WACC)	A methodology for calculating the cost of capital which includes compensation for debt and equity financing.

Heavy vehicle road reform terms³

community service obligations (CSO)	Where government obliges a public or private road service provider to meet a minimum level of service, associated with specific government policy objectives, which it would not otherwise provide on a commercial basis ⁴ .
congestion pricing	Pricing of public and private urban road transport that reflects real resource costs. Revenues could also be linked to use for road or transport purposes, e.g. maintenance or construction.
expenditure plans	A plan that includes a profile of capex and opex planned by all levels of government on key road segments over the next four years.
formation assets	The surface of the finished earthworks (excluding cut or fill batters) that form part of a road asset.
forward looking cost base (FLCB)	A life cycle approach using forward looking costs for the purposes of determining what revenue would be required to maintain current service standards efficiently and to meet future needs of users.
	The BBM can be applied to implement the FLCB.
full market road reform	Application of a market-based approach to all of the elements linked to the demand and supply of a service within a market – as opposed to a partial market reform which would only focus on certain users or elements in the market.
heavy vehicles (HV)	Vehicles more than 4.5 tonnes – typically rigid and articulated trucks and buses as well as special purpose vehicles such as cranes.
heavy vehicle (HV) asset registers	The asset registers' profile ratings for road segments according to HV access, safety, ride quality and reliability characteristics ⁵ .

³ Source unless stated otherwise: DIRD

⁴ Source: Austroads, CSO Framework for Roads.

⁵ Ratings can be viewed in open geospatial mapping platforms like Google Earth

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	heavy vehicle (HV) road reform	A joint reform process of the Commonwealth, state, territory and local governments aimed at establishing an economic market for the provision and use of HV infrastructure services – one that provides clear links between the needs of users, the charges they pay and the services they receive.
	hypothecated charges	Where taxes and charges collected from users of a service are directly returned to service providers to be reinvested in those services.
	light vehicles (LV)	Vehicles 4.5 tonnes or fewer, being both passenger cars and light commercial vehicles.
	Market-based model	A scheme where the supply and demand for a service reaches a classic microeconomic equilibrium which reflects both the users' willingness- to-pay for a level of quality at a given price and the suppliers' willingness to supply that quality at a given price.
	road related revenues/road related taxes and charges	For this report, this term refers to taxes and charges collected from road users and vehicle owners and includes access charges such as state-based fees (vehicle registration, vehicle stamp duty and driver licensing) and consumption or usage fees such as Commonwealth fuel excise ⁶ .
	road user charging	Cost recovery from road users to deliver the road services required by road users.
	tolls/toll roads	Direct user charges in the form of regulated, facility-based tolls for usage of specific road corridors.
	urban areas (versus regional areas)	Where used in a technical sense in this paper (i.e. when referring to data), the definition of urban and regional is aligned with a long-standing split used by the National Transport Commission in determining HV charges. Urban is defined based on the ABS's Significant Urban Area classification which defines urban areas of 10,000 or more population.
		Elsewhere in the paper, the term regional is used more generally (and not in a technical sense) to refer to areas outside cities and encompasses rural areas.

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⁶ A full and agreed definition of this term will be part of the forward work programme on Land Transport Market Reform.



I. Introduction

I.I Background

The Heavy Vehicle Road Reform (HVRR) Road Map aims to create a market for the provision and use of heavy vehicle (HV) infrastructure, with clear links between the needs of users, the charges they pay and the services they receive. The HVRR was endorsed by the Transport and Infrastructure Council (the Council) in May 2015.

A Forward Looking (lifecycle) Cost Base (FLCB) for HV charges is an important element of phase two of the HVRR Road Map. The successful implementation of a FLCB would support future HVRR objectives, such as regulatory and funding reform, and full market reform.

In November 2016, the Council agreed to the development of a prototype working model for a FLCB based on the Building Blocks Model (BBM) to underpin future HV charge calculations, as part of a package of measures to support phase two of the HVRR.

The National Transport Commission (NTC) was tasked with developing the prototype working model. The Commonwealth is working with states and territories on the financial policy aspects of a FLCB. The prototype will be presented to the Council by the NTC in November 2017.

The Commonwealth, through the Department of Infrastructure and Regional Development (DIRD), engaged Farrier Swier Consulting (FSC, us, we) to provide expert advice on the financial policy elements of developing a prototype HV revenue model to underpin future HV charge calculations. This report deals with how the revenues, specifically the allowed 'annual revenue requirement' (ARR), would be determined under a FLCB using a BBM. It does not deal with determining HV charges, reform of national charging arrangements or implications for Commonwealth - State and Territory funding arrangements unless it is directly relevant to the determination of the ARR.

I.2 The vision for HV road reform

Progressing HV road reform is an important component of the Australian Government's microeconomic reform agenda, building on its response to the Harper Competition Policy Review and Infrastructure Australia's Australian Infrastructure Plan. The Council of Australian Governments (COAG) has agreed to accelerate HV road reform, and to investigate the potential benefits of extending road user charging to all vehicles.

The ultimate goal of HV road reform is:

to turn the provision of heavy vehicle road infrastructure into an economic service where feasible. This would see a market established that links heavy vehicle user needs with the level of service they receive, the charges they pay and the investment of those charges back into heavy vehicle road services.⁷

Figure 2 summarises the vision of HV road services being economic services, with an integrated charging system.



Figure 2 - HV infrastructure as an economic service

Source: Transport and Infrastructure Council

There will continue to be a role for all governments to support the provision of basic road services to ensure social mobility, economic welfare, road safety and public security. Any reforms to HV road services' charging need to balance making roads economic services while recognising them as community services.

I.3 Scope of this advice

This report provides advice on the following matters:

- **BBM advantages and disadvantages** | An overview of the nature of the BBM and the advantages and disadvantages of using it to determine a FLCB for HV road services.
- **Proposed form of BBM** | The specific proposed form of the BBM under three scenarios:
 - price regulation of a Government department;
 - economic regulation of a Government department; and

⁷ Heavy Vehicle Road Reform – What we are doing and why we are doing it, Transport and Infrastructure Council



- economic regulation of Government corporation (as a long-term end point for reform).
- Selected BBM component specification | Preferred approaches for determining the following sub-set of components for a HV BBM:
 - return on capital and tax;
 - initial regulatory asset base (also referred to as the RAB or capital base), including:
 - how the initial RAB should be set; and
 - whether the road network should be broken into small networks in setting the RAB.
 - deprecation (also referred to as the return of capital).
- Managing revenue and cost risk | Advice on risk allocation and risk management tools under a BBM, including to manage changes in a road service provider's:
 - demand, which impacts its revenues; and
 - costs, which result in variances between its revenues and costs.
- Role of incentive regulation mechanisms | Advice on treating the level of service quality in the initial BBM and how treating the level of service might evolve.
- Implementation of BBM | Advice on 'next steps' to transition to a FLCB using a BBM for HV user charging.

We have included in the above analysis high-level information on relevant lessons learned from other regulated sectors.

Our report does not address other matters that could be considered in a possible second stage of work on the FLCB, including:

- Identifying principles of best practice for expenditure forecasting or assessment, defining efficient costs of service provision or dealing with stranded assets or inefficient capital expenditure. For this reason, we have not examined how capex and opex allowances should be determined although they being essential elements of the application of the BBM.
- How best to transition from the current PAYGO charging system to a FLCB, (including implications for Commonwealth State and Territory funding arrangements) although we do discuss certain transition issues, including in setting the RAB.
- Documenting the regulatory framework and institutions, including the functions and powers of an independent economic regulator and the nature of any arrangements for reviewing regulatory decisions.
- Determining HV charges to recover the ARR determined through the BBM, including different national approaches to determining HV charges.



- Examining funding arrangements for roads in remote and regional Australia, including CSOs.⁸
- Hypothecating revenues from HV charges to road service providers, although we note that economic regulation inherently assumes that this occurs and is a necessary precondition for realising the efficient service provision incentive effects intended by economic regulation.
- Assessing the implications for current asset valuation and depreciation practices for the purpose of statutory accounting.

⁸ One way the costs of funding roads in remote and regional Australia could be met is through CSOs. There are different ways in which the costs of providing CSOs could be provided for and calculated in the FLCB. If a CSO is to be explicitly funded then it could, for example, be calculated on a cash basis or on a FLCB basis.

2. Relevant context and factors considered

This section discusses the relevant context and factors we considered in developing our advice. It also makes a recommendation on the future price path for HV charges.

2.1 HV Road Reform Objective

Clarity on the objectives of the HV road reform is important because it affects the choice of principles and the design of the BBM. Our understanding of the objective of HV road reform is as follows:

HV road reform aims to establish an economic market for the provision and use of HV infrastructure services – one that promotes economic efficiency for the long-term interests of users, and provides clear links between the needs of users, the charges they pay and the services they receive.

The reform will also seek to integrate roads as both an economic service and a community service. It is understood that where governments require public road service providers to provide services deemed to be Community Service Obligations (CSO), then any associated costs will be either funded directly or through internal cross-subsidies rather than users through HV charges (or, in the future, LV charges). That is, government will ensure that HV services are subsidised, where it considers that the full economic costs should not be met by HV users.

This reform objective:

- is consistent with how price and economic regulation is applied in other sectors; and
- highlights the important role of economic efficiency (discussed in the next section).

2.2 Economic efficiency

The HV road reform aims to promote economic efficiency for the long-term interests of users. This section discusses:

- the dimensions of economic efficiency; and
- competitive neutrality principles.

2.2.1 Dimensions of economic efficiency

Economists typically identify three dimesons of economic efficiency – allocative, productive and dynamic efficiency. These are discussed in Box 1. These dimensions play an important role in the design and development of economic regulatory regimes.



Box 1 - Dimensions of economic efficiency

Productive efficiency means that HV road services are produced at minimum cost using the least-cost combination of inputs, including, for example:

- adopting life-cycle asset management planning techniques which optimise costs and asset performance over time; and
- selecting optimal designs, materials and construction techniques.

Allocative efficiency requires that resources are allocated to their most productive or highly-valued uses in the economy. Importantly, the structure of prices needs to ensure that revenues are adequate to support efficient investment (a dynamic dimension) while also ensuring that production is expanded to levels where prices reflect marginal costs. Allocative efficiency also includes:

- understanding changing market requirements and consumer and stakeholder needs and planning business investment and operations accordingly; and
- adopting good demand forecasting practices that support efficient planning expansion to meet demand and avoiding significant over or under investment.

Dynamic efficiency in producing HV road services involves the efficient allocation and production of goods and services over time. It would include:

- acquiring and managing information that assists road owners and users make better decisions; and
- seeking continuous improvement and innovation in all aspects of investment and operating practices.

2.2.2 Potential role for competitive neutrality principles

Whether or not competitive neutrality principles apply is relevant to determining the level of HV revenues and to determining the cost of capital (see section 5).

The Australian states and territories are a party to the inter-governmental Competition Principles Agreement (CPA), which is one of the three agreements that underpin National Competition Policy (NCP). Under the CPA, each state and territory is obliged to introduce and apply competitive neutrality policy and principles to local government and to all government agencies. The Commonwealth Government's competitive neutrality policy is currently being reviewed.⁹

The objective of competitive neutrality is set out in Clause 3(1) of the CPA as:

⁹ <u>https://consult.treasury.gov.au/market-and-competition-policy-division/competitive-neutrality-review/supporting_documents/CN%20Review%20Consultation%20Paper.pdf</u>



the elimination of resource allocation distortions arising out of the public ownership of entities engaged in significant business activities: Government business should not enjoy any net competitive advantage simply as a result of their public sector ownership.

These principles only apply to the business activities of publicly owned entities, not to the non-business, non-profit activities of these entities.

The Commonwealth's competitive neutrality policy sets out the following criteria for identifying a 'business activity':

- User charging | there must be user-charging for goods or services this criterion will apply following HV road reform.
- Managerial independence in setting prices | managers of the activity have a degree of independence over the production or supply of the good or service and the price at which it is provided this would presumably be the case were road service providers to become more business-like (for example, a statutory authority or a government owned corporation (GOC) see section 2.5.2 below) and price setting was overseen by an independent regulator.
- Actual or potential competition | there must be an actual or potential competitor (either in the private or public sector) i.e. users are not restricted by law or policy from choosing alternative sources of supply this is discussed further below.

Actual or potential competition between road and rail freight

We discussed with stakeholders whether there was evidence of actual or potential competition between road and rail freight services – there were varying views.

The 2006 Productivity Commission¹⁰ inquiry found that:

Competitive distortions between road and rail have been limited and not a significant source of market inefficiency. The case that road is subsidised relative to rail is not compelling, even accounting for externalities. And even if network road charges were greatly increased, rail would not derive much benefit given limited substitutability and much complementarity between the two transport modes.

Points that arose in discussion were:

- It was generally agreed that currently much of a jurisdiction's road network does not compete with rail freight, but some jurisdictions identified specific parts of their road networks where they considered there was meaningful competition with rail.
- One jurisdiction noted that road and rail freight should be considered as elements of a single freight system and the objective and the design of reform should facilitate a

¹⁰ Productivity Commission Inquiry Report, Road and Rail Freight Infrastructure Pricing, 2006



consistent approach to planning, investment, funding and charging, such that freight is moved in the most efficient and productive way.

- Rail operators are likely to take the view that road freight does compete with rail and that competitive neutrality principles should be adopted for HV charging to avoid economic distortions in the road and rail freight markets.
- One jurisdiction considered that competitive neutrality concerns could be dealt with on a targeted basis (i.e. only apply the competitive neutrality principles to parts of a road network that competes with rail).
- In the long term, technology and market developments may occur that change the nature of competition between road and rail freight, but these developments are inherently uncertain. Given the long-term nature of HV road reform, there may be an argument for adopting a principled approach (especially to setting the cost of capital) that promotes more robust outcomes i.e. avoiding resource allocation distortions as competitive conditions change in the road and rail freight markets.

2.3 Proposed HV revenue principles

It is good regulatory practice to set out explicitly the principles for determining regulated revenues, which guide the design and application of the BBM.

As a starting point, we propose the following HV revenue principles:

- (a) A regulated road service provider business should have a reasonable opportunity to recover at least the costs of providing HV services, including earning an appropriate rate of return on the unrecovered cost of capital expenditure, and the costs of operating and maintaining its assets; and
- (b) Users of HV road services should be protected from paying charges for services that are materially above the costs of providing them.

These principles reflect the HV road reform objective discussed above and are fundamental principles of other economic regulatory regimes.^{11 12}

¹¹ See for example the revenue and pricing principles in section 7A of the National Electricity Law (NEL) - National Electricity (South Australia) Act 1996

¹² We note that the precise drafting of such principles will require further policy and legal review. We have used the term 'reasonable opportunity' to recover at least the costs of providing HV services, following the language of section 7A of the NEL. We understand that this language reflects the idea that determining the costs of providing HV services cannot be determined precisely and that service providers should not be guaranteed cost recovery in every circumstance. It is therefore prudent to apply a 'reasonableness' standard to the ability of a service provider to achieve cost recovery. Likewise, in our view it is likely to be difficult or perhaps impossible for a regulator to guarantee that the users of HV road services should pay exactly the cost of providing the services (and no more) and it is therefore prudent to adopt a 'materially above' standard.



There are other principles¹³ which will need to be considered in due course, but these are not fundamental to our current advice.

2.4 Relevant policy context

There are three broader related policy questions that we considered.

Full market expenditure approach

A FLCB for HV charges could be developed using either a 'partial market expenditure' approach or a 'full market expenditure' approach. These are discussed below and in further detail in Appendix C.

A 'partial market expenditure' approach would involve developing a standalone HV cost base and a standalone HV ARR, to develop HV charges. This approach would be applied independent of, and separate to any future development of, any cost base, ARR and charges for LV services.

A 'full market expenditure' approach would involve deriving the capital and operating expenditure attributed or allocated to HV from the total capital and operating expenditure plans of road service providers to meet the needs of the full market (i.e. HV and LV).

We agreed with stakeholders to adopt a 'full market expenditure' approach. This recognises the reality that roads are designed, built, maintained and financed through an integrated process and provide services to both HV and LV.

There are various ways in which a 'full market expenditure' approach could be applied. Our recommended option (which is Option 4 in Appendix C) is to: develop an HV Initial RAB as part of the current reforms and develop a LV Initial RAB at the time any future LV reforms are undertaken; attribute or allocate shared expenditure between HV and LV; and then to develop a standalone HV cost base and HV ARR, to develop HV charges. This is illustrated in Figure 3.

¹³ For example, sec 7A of the NEL includes principles that: regard should be had to the regulatory asset base set previously by government or a regulator; that a regulated price should include a return commensurate with regulatory and commercial risks involved in providing the service; regard should be had to the economic costs and risks of the potential for under and over investment; and regard should be had to the economic costs and risks of the potential for under and over utilisation of the assets.



HV Opening RAB Shared expenditure LV Opening RAB LV Opening RAB LV Opening

Figure 3 - Separate HV RAB with the allocation of shared expenditure

We propose this option because it:

- is tailored to preparing road service providers' ARRs for HV services;
- enables a suitable HV RAB valuation to be determined that is fit-for-purpose given governments' policy objectives;
- maximizes flexibility about how to apply each component of the BBM;
- recognizes that HV and LV services are inherently integrated, but that the nature and timing of the reforms of the two sectors will differ; and
- does not appear to create any constraints on future LV charging reform.

How to deal with potential jurisdiction-specific issues

It was agreed that this report should only set out a generic national approach and not consider any jurisdiction-specific issues, or the implications of jurisdictions adopting different approaches to the BBM, or differing transition timing.

Potential future introduction of congestion pricing

We note that if congestion pricing was adopted it could affect the total revenues recovered from HV charges depending on the form of control. This has been considered in our analysis of depreciation.¹⁴

2.5 Future scenarios

This report distinguishes between price regulation and economic regulation:

• **Price regulation** | is a form of regulation that calculates a revenue amount based on forecasts of the providers' forward-looking costs of providing HV road services, which

¹⁴ The Harper and Henry reviews recommended that reform of road pricing include congestion pricing and its provision should be a priority for Australian governments. Congestion pricing is a form of 'peak load pricing' that, if adopted, would affect the total revenues recovered from HV charges. Our analysis suggests that under some scenarios this may cause a need to review the depreciation schedule method. This is discussed in Appendix B..



in turn is used to calculate the level of each parameter of the HV charges, taking into account other information, such as forecast demand.

How forecast and actual revenues received by a road service provider that are linked to provision of HV services will be determined in practice will depend on (1) the details of any new national HV charging and revenue allocation arrangements, and (2) state and territory government budget and financial management arrangements.

Where a road service provider is part of government, there is no necessary link between the forecast revenues that are used to set HV charges, and the actual revenues received by the road service provider to cover its HV related costs. However, for the purpose of this paper, we make the simplifying assumption that under price regulation, the notional revenue forecast produced by the BBM used to determine HV charges is also used to set a road service providers' forecast revenue as this is consistent with our understanding of one of the goals of HV Road reform.

• **Economic regulation** | is a form of regulation that applies the BBM to determine ARRs that reflect the prudent and efficient costs, and agreed levels of service. It may also incorporate strengthened incentives to promote efficiency.

We also recognise that road service providers are currently structured as government departments but they may in the future evolve into statutory authorities or GOCs.

Our analysis shows that the most appropriate form of BBM will vary depending on which of the following three future scenarios apply to HV services:

- 1. price regulation of government department;
- 2. economic regulation of government department; and
- 3. economic regulation of a statutory authority / GOC.

The following sub-sections explain:

- the potential transition from price regulation to economic regulation; and
- potential future changes in the organisational form of road service providers.

2.5.1 Transition from price regulation to economic regulation

Federal, state and territory governments have agreed to establish independent 'price regulation'¹⁵ as part of their December 2015 decision to reform the way the HV charges are set and collected.

¹⁵ Feedback provided suggested that the concepts of 'price regulation' and 'economic regulation' adopted by governments are not used elsewhere in utility regulation and that this could potentially be confusing. We do not see this as problematic provided the concepts are clearly communicated.

We understand that governments have also considered a 'price regulator' evolving into an 'economic regulator', though no decisions have yet been made to implement this reform. The distinction between price regulation and economic regulation is set out in Box 3.

Dox 3 – Distinction between price regulation and economic regulation			
Function	Price regulator	Economic regulator	
Sets HV charges based on agreed principles and methodology	Yes	Yes	
Audits input data to ensure it is within scope of charge setting methodology (i.e. relevant road related expenditures only)	Yes	Yes	
Defines efficient, prudent or otherwise recoverable (e.g. CSOs if cross-subsidies in place) expenditure	No	Yes	
Scrutinises data to ensure only efficient, prudent or otherwise recoverable expenditures flow through to user charges	No	Yes	
Develops and sets agreed service levels	No	Yes	
Monitors delivery of agreed service levels, including community service obligations	No	Yes	
Conducts ex-posts evaluation of investments	No	Yes	

Box 3 - Distinction be	tween price regulation	and economic regulation
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Source: Land Transport Market Reform. Independent price regulation of heavy vehicle charges, Discussion Paper

This report is not primarily concerned with defining the role of an independent regulator. However, there are two aspects of independent regulation that we have considered:

- The potential to evolve in future from price regulation to economic regulation. This is expanded on in addressing the scenarios described above.
- Who is best placed to decide the application of the pricing principles and methodology – where it is helpful, we comment on the potential role of a regulator and other parties in making these decisions.

2.5.2 Organisational form for road service providers

Road service providers are currently organised as government departments, but may in the future be restructured into statutory authorities or GOCs. We understand that this may be in conjunction with steps to evolve from price regulation to economic regulation.

In Australia, statutory corporations are created by acts of state, territory or federal parliament. Current Commonwealth statutory corporations include Australia Post, Airservices Australia and the Australian Rail Track Corporation. GOCs operate more closely along the Corporations Act shareholding and governance model. Statutory and GOCs are separated from normal government operations to promote their profitability, support competitive neutrality with price competitive service providers, and provide a

greater level of independence of decision making from the government (to ensure that decisions are made on a commercial basis with less political interference).

While we have not defined the exact implications of such a reform, we understand changes of this kind would mean that road service providers would:

- become more 'business like';
- receive the revenues generated by the services they provide
- have a balance sheet that includes road assets and associated liabilities and equity;
- have greater freedom to operate at arms-length from government; and
- have greater scope and accountability for managing financial outcomes and to bear financial risks, including risks allocated through the design of economic regulation, by being able to earn profits or incur losses and undertake borrowing.

2.6 Managing revenue and cost risk

Determining appropriate mechanisms for managing risk is an important financial policy aspect of the design of economic regulation arrangements that needs to be considered in designing regulatory arrangements.

A road service provider's revenues will be calculated based on the BBM, including forecast expenditures. This gives rise to four broad types of risks:

- demand risk;
- cost risk;
- service risk; and
- price risk.

Section 8 sets out a high-level overview of risk management allocation considerations; the management of demand risk through selection of the control mechanism (under economic regulation); and the management of cost risk, including the role of a true-up mechanism. Service risk is discussed in section 9. Price risk is discussed in the following section.

2.7 Managing user impacts of transition from PAYGO to FLCB

An important consideration in our advice on the initial RAB is managing the impacts of transition from PAYGO to a FLCB. We considered three transitional issues:

- 1. Managing the future price path.
- 2. Recognising that at least a proportion of road service providers' assets have been paid for up-front by users.
- 3. Moving to a FLCB.



2.7.1 Managing the future price path

Experience in designing and implementing similar reforms indicates that a critical policy issue for governments is whether to manage the future 'price path' seen by users (and other stakeholders) after implementing the FLCB and related reforms; and if so, how this should be done.

We recommend that the financial policy elements for the FLCB be set to support a reasonably stable and predictable rate of change in HV charges over a transitional period.

We note that price path transition management will warrant considerable debate by governments and this will require more detailed analysis than we have been able to undertake here.

The rationale for this recommendation is:

- 1. The NTC exploratory work found that, were a depreciated replacement cost valuation to be adopted, there may be a significant increase in revenues and charges.
- 2. Policy discussion that supports the need for managing the price path, including to support road reform.
- 3. The precedents for price path management when implementing similar reforms in Australian infrastructure services.

Each is discussed further below.

NTC Exploratory work

The NTC exploratory work¹⁶ found that the depreciated replacement cost value for road assets for all the jurisdictions was approximately \$199.1 billion. The NTC then considered the initial RAB values required to achieve a 'transition goal' and it found that a significant reduction in the initial RAB values was necessary to obtain a smooth price transition.¹⁷ This appears to mean that were a depreciated replacement cost valuation to be adopted, there may be a significant increase in revenues and charges. As discussed in detail in section 6 below, a line-in-the-sand approach to setting the initial RAB could support stable prices when transitioning to the FLCB.

Policy discussion on transition price path management

Box 4 summarises policy discussion on the rationale for price path management.

¹⁶ National heavy vehicle charges: Adopting a life cycle approach using forward looking costs; Results of exploratory work, National Transport Commission. June 2016.

¹⁷ The NTC notes that this analysis should be treated with caution. If any of the underlying assumptions change such as cost allocation between light and heavy vehicles, then this finding could change.



Box 4 - Policy Discussion on Transitional Price path management

The Harper Committee recommended that:

proper investment and demand management signals for the road network should be the long-term goal. A shift to more direct charging for roads should be pursued in a way that reconfigures current revenues and expenditures to deliver the best results for road users and the community rather than as an additional tax impost. This will build public confidence in the reform.¹⁸

Darryl Biggar of the ACCC suggests that having regard to consumers' interests in reasonable stable and predictable prices is a proper economic consideration:

For several decades at least, economists have argued that regulators should focus on ensuring that regulated prices – at least at the margin – approximate marginal cost. Where prices must for cost-recovery purposes, say, depart from marginal cost, economists conventionally recommend that they should do so in a manner which minimises deadweight loss.....

I suggest that the conventional economic approach to natural monopoly regulation has neglected a key element of the picture. Rather than the minimization of deadweight loss, I suggest that natural monopoly regulation is often better understood as an attempt to protect sunk investments – in particular, the sunk investments made by the customers of the regulated firm.

In the case of most monopoly services, users can choose to make sunk investments which increase their demand for or value of the monopoly services – such as choosing where to live, where to locate their manufacturing plant, or whether to invest in developing new products which make use of the monopoly services. The need for sunk investments gives rise to a conventional hold-up problem – users fear that once these investments are made, the value of the investment will be expropriated by the monopolist. Although there exist private mechanisms for controlling the hold-up problem, such as long-term contracts, these are not always feasible. In many cases, the best way to protect and promote sunk investments by users is through conventional natural monopoly regulation.¹⁹

While this theory has not been embraced by the Productivity Commission²⁰, we think that it has relevance here. HV users can be expected to have made investments to some extent based on the existing level of the PAYGO based charges, and so arguably it may be

¹⁸ Pg 214 Competition Policy Review, Final Report, March 2015

¹⁹ Is Protecting Sunk Investments by Consumers a Key Rationale for Natural, Monopoly Regulation? Darryl Biggar. (Special Economic Adviser (Regulatory) at the ACCC

²⁰ Section 3.4, Electricity Network Regulation Inquiry report. Productive Commission, 26 June 2013.



reasonable to take these investments into account by managing the price path for HV charges so that it is reasonably stable and predictable for at least the period over which HV users recover previous investments made in their businesses.

Precedents for price path management

There are many examples in Australia where a government or a regulator has established a transition price path, either when establishing new economic regulation regime or to address concerns with price shock - see Box 5.

Box 5 - Examples of price path transition management

Price path transition management can involve explicitly setting a price path (for example through setting price caps on future change in prices); or through adjusting costs, typically through setting the initial RAB; or both. Appendix B discusses experience with setting the initial RAB in more detail.

Examples where similar reforms have involved managing the price path include:

- Melbourne's water businesses (2004): The line-in-the-sand approach was used to set initial RABs for commencing a new economic regulation regime. 'Reverse engineering' of the BBM framework was undertaken to determine the value of assets that would be consistent with a variety of return and pricing assumptions.
- NSW electricity distribution (2005): The regulator (IPART) calculated revenues based on a BBM but determined a 'glide path' to move to (higher) BBM prices over five years.
- Victorian electricity industry reform (mid 1990s): Several transitional mechanisms were used to manage electricity prices, including: asset valuation adjustments; grid equalisation payments; retail price caps; and side constraints.
- Port of Melbourne privatisation lease (2016): Government established a CPI price cap on price adjustments for approximately 15 to 20 years. Port charges are thereafter based on a BBM.

Recommendation

It is recommended that the financial policy elements for the FLCB be set to support a reasonably stable and predictable rate of change in HV charges over a transitional period.



2.7.2 Existing road assets already paid for by users

PAYGO is based on establishing a cost base using a 7-year average, with the HV portion separated out for recovery through HV charges.²¹ This means that for the existing road assets, at least a proportion of the assets have been paid for up-front by users. This is a relevant factor in setting the initial RAB (see section 6.3).

We understand the exact extent to which existing road assets have been paid for up-front is not clear, and the scope of our work did not require us to investigate this question. Our analysis has adopted a simplified assumption that under PAYGO all assets have been paid for up-front by users, but we note that this assumption will likely need to be investigated further.

2.7.3 Intergenerational equity

As discussed above, the PAYGO approach means that capex is recovered from the current generation of users. However, a key feature of a FLCB, and the BBM, is that capex is recovered progressively over the remaining economic life of an asset. One of the principles for setting depreciation schedules (discussed in section 7) is to consider intergenerational equity, which means spreading the recovery of capital costs evenly over the remaining economic life of the asset.

This highlights that the transition from PAYGO to FLCB will change the incidence of which generation of users pays for the capex associated with HV road services.

2.8 Regulatory and statutory accounting

Implementing the BBM will require establishing a system of regulatory accounting. An issue for those involved in financial and accounting functions is understanding the purpose of regulatory accounting and differences between regulatory and statutory accounting.

Regulatory and statutory accounting have different purposes and are likely to produce different information. It is neither necessary nor desirable for the regulatory asset value to be set equal, or otherwise to 'converge' over time, to the statutory asset value.

The fundamental principle of the BBM is that a regulated business should have a reasonable expectation of recovering its costs over time.

The purpose of statutory accounts, however, is to assist the owners and other interested stakeholders understanding the financial position of a business in accordance with

²¹ PAYGO was implemented in 1992 and it is unclear what capital expenditure incurred prior to then now remains unrecovered (if any).



prevailing accounting standards, and to be able to compare this with the financial position of other businesses.

Statutory accounts reflect a common set of financial metrics that are applied across all industries and that make representations as to the value of the business. In contrast, a RAB can reflect regulatory assumptions and decisions that are unique to a business or industry. These can also vary by jurisdiction.

One consequence of these different purposes is that the RAB and the Statutory Asset (SAV) will not necessarily be the same at any point in time.

Potential reasons for differences in statutory and regulatory values can include:

- the initial RAB can be set using a variety of alternative approaches, including a "linein-the-sand" approach, that bear no relation to historical costs;
- a SAV may be revalued because of, for instance, changes in the fair value of the assets, whereas a regulatory asset base is typically not revalued;
- a SAV for a regulated business may vary due to changes in accounting policies, legislation and/or government regulations, whereas the initial RAB is typically not revalued;
- the regulatory accounts of a business only include valuations for those assets that are used in the provision of services subject to regulation, whereas SAVs incorporate all assets owned by the business, whether or not they are used in the provision of the regulated service; and
- capital contributions and gifted assets can be excluded from the RAB (since there is no cost to a regulated business to acquire them), whereas the value of these contributions and assets is included in SAVs as they increase the capital stock of the business.



3. Overview and assessment of Building Blocks Model

This section overviews the nature of the BBM and its advantages and disadvantages for determining a FLCB for the HV roads sector.

3.1 Overview of the BBM

3.1.1 Nature of the BBM

The BBM is a method for spreading the recovery of expenditure over time. In many infrastructure sectors expenditure is lumpy, but there is a desire for revenue to change smoothly through time. This means that the revenue stream should have the same present value as the expenditure stream.

More specifically, the BBM is a forward-looking method for:

- determining the allowed revenues over a forthcoming period (i.e. the control period²²) that reflect the regulated business' forecast costs of providing its services; and
- recording regulatory accounting information for calculating capital stock (the RAB) and revenues beyond the current control period.

The BBM is widely used in Australia (and other jurisdictions) for the economic regulation of monopoly services that require long-lived assets, such as electricity, gas water and fixed line telecommunications. The BBM is therefore potentially also suitable for regulating road services given the monopoly nature of the services and the long lives of road assets.

A brief history of how the BBM has been applied in utility regulation is set out in Box 6.

Box 6 The history of the BBM in utility regulation

The essential features of the BBM were first applied in independent regulation of utility prices in the 1930's in the United States (US) where it is called cost of service regulation) and it continues as the basis of utility regulation in the US today.

The BBM was applied in the United Kingdom (UK) as the basis for regulation of monopoly electricity, gas and water businesses as part the reform and privatisation of these industries during the 1980's. As discussed further in section 9, the form of BBM adopted in the UK sought to create stronger incentives for cost

²² The "control period" refers to the period over which the control mechanism applies. When a service is regulated, the "control period" is commonly referred to as the "regulatory control period" or the "regulatory period".



minimisation. The BBM continues to be used in the UK today, although the detailed application has evolved significantly since the 1980's. (See Appendix D).

The UK utility regulation experience was influential in the development of the regulatory model for privatised and corporatised electricity and gas networks in Australia during the 1990's. Subsequently the BBM model was applied as the dominant method for regulation of Australian water businesses in the 2000's. The ACCC in 2011 adopted the BBM for regulation of fixed line telecommunications services.²³

The Productivity Commission in its 2013 review of electricity network regulation found that

The building block approach generally works well [for the electricity networks] and is a suitable model for the regulation of electricity networks.

Typically, regulated businesses can only recover 'prudent and efficient' costs – defined as the costs that a benchmark entity, operating in the regulated business' circumstances, would incur. Regulated businesses operate under a variety of different incentive arrangements, ranging from none to low-powered to high-powered incentive schemes. That is, a BBM could be applied with, or without, explicit incentives that reward (or penalise) the regulated business, such as for reducing (or increasing) its expenditure and / or improving (or worsening) its service performance.

The application of a BBM, however, does not require allowing only the recovery of 'prudent and efficient' costs; introducing explicit incentive arrangements; or independent economic regulation. It could be implemented only for price setting purposes (as discussed above) – i.e. price regulation.

Insights with the various issues and challenges drawn from experience in implementing and applying the BBM are discussed in this as report as follows:

• Limitations of the BBM (section 3.2.1).

²³ Historically, the Total Service Long Run Incremental Cost (TSLRIC) method has been used in Australia (and internationally) for access pricing in telecommunications, but since 2011, the BBM has been adopted by the ACCC for regulation of fixed line telecommunications services. The objective of the TSLRIC method is to derive the price that a hypothetical efficient new entrant would need to charge to recover its costs, including a commercial return. In contrast, the objective of the BBM is to derive prices that provide a regulated business, if efficiently run, with a reasonable opportunity to recover the actual cost of providing the relevant services. The main justification for TSLRIC pricing in telecommunications has been to hold open the possibility of facilities-based competition (i.e. direct competition for the bottleneck part of the infrastructure). The transition from copper to fibre and broadband technologies is viewed as reducing the potential for facilities-based competition (though this is subject to debate). In this context, there is reduced merit in maintaining price regulation settings aimed at encouraging entry, and instead the key objectives for the regulatory regime should be to ensure that the scope for excessive profits is minimised while maintaining incentives for continued, and efficient, investment. The BBM is now considered by the ACCC as better suited to supporting this objective for fixed line telecommunications services.



- Experience with determining the return on capital and tax (section 5).
- Experience with determining the initial regulatory asset base (section 6 and Appendix A).
- Issues and experience with determining the deprecation expenditure allowance (section 7).
- Issues and experience with allocating and managing revenue and costs risks (section 8) including determining the control mechanism (section 8.2).
- Issues and experience concerning the strengthening of incentives including:
 - the historical development of incentive regulation in Australia and internationally (Box 14).
 - mechanisms to achieve goals such as cost minimisation or meeting or improving service levels (section 9)
 - the 'Totex' approach which address concerns with potential bias towards capital solutions (rather than operating solutions) and incentives to reclassify expenditure (Appendix D)

3.1.2 Revenue and price setting framework

Establishing the FLCB requires specifying a 'HV revenue model' and it is proposed that this would be based on the BBM. Figure 4 sets how we envisage the HV revenue model (based on the BBM) would relate to the overall revenue and price setting framework for HV services.

Figure 4 - HV revenue and price setting framework



We expect that the HV revenue model would take account of a set of overall HV reform objectives and HV revenue principles, as discussed in section 2.

The HV revenue model is a BBM that determines the ARR that the road service provider can recover from road users for providing its HV services for each year of a control period. Defining the HV services is important because:

- the road service provider should only recover the costs of the services that it provides;
- different services will cost the road service provider different amounts to provide; and


• it may not be appropriate to use the BBM to determine a road service provider's allowed revenues for all of its services. For this reason, there may be a need to classify a road service provider's services into distinct categories and only apply the BBM to some of them²⁴.

Once the road service provider's ARR is determined through the HV revenue model, a control mechanism can be used to dictate how the road service provider can recover its ARR through its HV charges. The control mechanism is therefore the 'bridge' between the ARR (and the BBM) and charges that are applied to road users. Neither the control mechanism nor the HV charges are part of the BBM, although they are necessary to recover the ARR determined using the BBM under economic regulation. Revenue caps and price caps are common control mechanisms. Control mechanisms are discussed further in section 8.2 below.

²⁴ For example, if a road service provider were to offer and charge for other services (for example registration and licensing services) that are to be regulated but do not require capital inputs, then the BBM would likely not be the appropriate method for setting charges for these services. This situation arises in other utility sectors.



3.1.3 Potential components of the HV revenue model

Figure 5 overviews the potential components of the HV revenue model under a BBM.



Figure 5 - Potential components of HV revenue model

The opening regulatory asset base²⁵ for a control period is calculated using a 'roll forward model', which adds an inflation²⁶ adjustment and capex to the capital base from the previous control period, and subtracts depreciation and disposals for that period. (See sections 10.3.10 and 10.4.1 below). The regulatory asset base is then rolled forward each year within the control period for inflation, capex, depreciation²⁷ and disposals²⁸.

The ARR for each year of a control period is calculated by adding together:

- three 'required' categories of forecast costs:
 - return on capital this is the product of the rate or return and the projected RAB;
 - depreciation this is also determined using the RAB; and
 - opex.
- two 'optional' categories of forecast costs:

²⁵ We adopt the commonly used term "regulatory asset base", or RAB, although the asset base need not be regulated.

²⁶ As discussed in section 7.4.2, if real depreciation is adopted, then the RAB needs to be inflated each year and the value of that inflation adjustment needs to be deducted from building blocks revenue to ensure that the full value of the asset is recovered over the life of that asset.

²⁷ The RAB can be rolled forward based on either actual capex incurred during the period or forecast depreciation at the start of the period. The two approaches raise different risks and incentives for road service providers, which are discussed further in sections 9 and 11.

²⁸ And capital contributions from users or government where these are relevant.



- corporate income tax allowance, which may be adjusted for the value of imputation credits received by shareholders. This would only be required if the return on capital is determined on "post-tax" basis. No separate corporate income tax building block would apply if a pre-tax WACC is used as the WACC would be grossed up to include an assumed cost of corporate income tax. This is discussed further in section 5; and
- revenue adjustments, such as any revenue under or over-recovery amounts, or any incentive rewards or penalties, from the previous control period.

The ARR is then used to set charges to be recovered from HV users (and potentially CSO payments if government determines that certain services should not be subject to full user cost recovery).

Figure 6 illustrates the contributions that each building block makes to the total ARR for the NSW electricity transmission network service provider, TransGrid, over a five-year regulatory control period. It shows that more than half of its revenue allowance comes from the return on capital, about a quarter from opex, about a sixth from depreciation and the balance from its tax allowance and other revenue adjustments. This is illustrative only and the percentage shares will differ based on the industry, service provider, method of setting the initial RAB, and regulatory period.





3.2 Advantages and disadvantages of BBM

We have assessed the advantages and disadvantages of the BBM in three ways:

- Standalone assessment to promote economic efficiency generally.
- Relative assessment against alternatives generally.
- Assessment in the context of HV road reform.



Here we have considered the merits of BBM as a device for promoting economic efficiency, without comparing it to alternative approaches or considering the specific circumstances of the HV services and the proposed reforms.

The BBM has several important benefits, including that it:

- is flexible and conceptually straightforward , which means that it can be readily adapted to the circumstances in which it is being applied. It can:
 - evolve over time to include more sophisticated arrangements, such as incentives to promote efficiency; and
 - be designed so ensure revenues closely track costs and to achieve desired price outcomes.
- is based on accounting principles this promotes transparency and enables the basis of revenue setting to be widely understood;
- if properly applied, gives:

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- users' confidence that they will pay only once for the use of assets over the assets' economic lives – this ensures users are not over-charged; and
- service providers a reasonable opportunity to recover at least the costs of providing their services – thereby promoting funding certainty.
- promotes intergenerational equity by spreading the cost recovery of long-lived assets over their economic lives.

The BBM also has some potential limitations which should be considered in the way it is implemented:

- it can potentially be information-intensive, including about the service provider's RAB and expenditure;
- it can be challenging to maintain a focus on benchmark efficient costs. Regulators in other industries have responded to this by introducing sophisticated incentive arrangements;
- it relies on information held by the service provider, which can give it an information advantage in its dealings with the regulator and users;
- it may lead to detailed (and esoteric) debates on methodological issues that may not be proportional to the ultimate benefits to users. This can particularly be an issue in calculating the cost of capital. This can make it difficult and complex for users to engage with; and
- it requires understanding the service standards on which the efficient costs are based. These standards can be difficult to define, monitor and enforce.

These limitations highlight the need to carefully design the regulatory framework and to use principles of best practice regulation to ensure the regime is fit for purpose.



3.2.2 Relative assessment against feasible alternatives generally

Here we have considered the merits of the BBM compared to another potential approach – the renewals' annuity approach – again, without reference to the specific circumstances of the HV services and the proposed reforms.

Box 7 overviews the renewals' annuity approach.

Box 7 – Renewals' annuity approach

An annuity approach for recovering renewals' costs involves calculating a series of periodic payments (typically annual) that recover the ongoing asset renewal and rehabilitation costs necessary to maintain the operating capacity of the infrastructure indefinitely. It does this by applying a smoothed annual charge.

The charge includes the return on, and return of, capital that are calculated separately under the 'building blocks' approach.

Assets best suited to an annuity approach will typically be renewable rather than replaceable, and have ongoing, constant demand.

Typical characteristics of a renewals' annuity approach are:

- an assumed constant asset value over time, with no reduction for depreciation;
- smoothed profile of renewal costs;
- a sinking fund financed via debt or equity;
- robust asset management plans; and
- expenditure programs of 20+ years (at least).

Source: National Transport Commission, National heavy vehicle charges: Adopting a life cycle approach using forward looking costs, Results of exploratory work, June 2016

The following table compares the BBM under the economic regulation scenario and the renewals' annuity approach.

Features / considerations	BBM	Renewals' annuity approach
<i>Is the method fit for purpose for all types of capital items</i> ²⁹ ?	Yes – can be applied to all types of capital items and for capital expenditure programs of any duration.	No – typically applied to renewals with constant demand and long term expenditure programs. Not readily applicable for renewals with uncertain demand, augmentations, expansions, asset reconfiguration, asset disposals.

Table 1 - Comparison of BBM and renewals' annuity approach

²⁹ Types of capital include: renewals; augmentations, expansions, asset reconfiguration, asset disposals.



Features / considerations	BBM	Renewals' annuity approach
Does the method contribute to transparency over revenue and charging determination?	Yes – relies on consistent commercial accounting concepts. Does not rely on high-quality long-term asset planning and forecasting – can be based on short-term capital expenditure forecasts. Provides assurance to road	Depends – relies on the stability and transparency of undertaking long term-asset planning and on low levels of forecasting error.
	owner that deprecation will be fully recovered while assuring users that the asset cost is only recovered once.	
<i>Is the method dependent on the quality long term asset planning information?</i>	No – although robust long-term asset planning is desirable (because it contributes to enhancing efficiency) it is not necessary to apply the BBM method.	Yes – accuracy of charge calculation depends on existence of quality long term asset planning information.
<i>Is there potential for cost forecasting error?</i>	Depends – RAB provides some protect for capex, and regulation can introduce cost sharing arrangements to address such error, including cost pass through mechanisms and contingent projects. Can also manage through length of control period.	Yes – need to establish a sinking fund for differences between forecast and actual expenditure.
<i>Is the method able to smooth the revenue path in response to lumpy operational and capital costs</i>	Yes – can potentially have revenue volatility however can potentially be addressed, for example through changes in depreciation profile.	Yes – if the annuity charge is not adjusted significantly through time. But given annuity renewals approach is likely only to be suitable for some asset types, this smoothing benefit would only apply to part of the business' revenues
		be adjusted through time.
Can method contribute to regulatory certainty over charging?	No – does not provide long- term regulatory certainty over future level of charges.	Yes – long term fixed consumption charges can create regulatory certainty over future level of charges.
Does it require harmonisation of accounting arrangements?	No – although harmonised BBM rules are desirable.	Yes – NTC exploratory study considered harmonised renewals accounting between jurisdictions was required.
Are there any additional financing requirements?	No – the accounting basis of the BBM means there can be alignment between revenue determination and the road service provider's financing structure.	Yes – need to establish a sinking fund to fund differences between forecast and actual expenditure



Features / considerations	BBM	Renewals' annuity approach
Does the method facilitate independent regulatory review of capital expenditure efficiency?	Yes – facilitates regular regulatory review of the efficiency of capital and operating expenditure forecasts.	No – typically applied to renewals with constant demand and long term expenditure programs.

3.2.3 Assessment in context of HV road reform

Here we have considered the PAYGO method and the BBM in the HV road reform context.

Assessment of PAYGO and the BBM

As noted, the current PAYGO method establishes a cost base using a seven-year average of expenditure covering all road construction and maintenance costs (for LV and HV). The NTC then determines a cost allocation to HV which is recovered through HV charges.

If HV expenditure was constant over time, then the BBM would calculate roughly the same level of revenue over time as the PAYGO method.

Analysis undertaken by the NTC³⁰ of expenditure trends since 2005 shows that HV expenditure has not been constant over time. It found that while the PAYGO mechanism has performed as intended by smoothing expenditure and revenue over the long term, there are significant year to year variations between revenue and expenditure. The NTC has noted that:

for governments and heavy vehicle operators alike, these differences create short term challenges. For governments, any shortfall in revenue compared to expenditure creates undesirable fiscal pressure. Whereas for vehicle owners, an excess in revenue over expenditure indicates that heavy vehicle charges are higher than the cost recovery principle require.

The NTC has noted that the application of the BBM could benefit the HV road industry in the following ways:

- Increasing certainty in road funding, which could deliver the following efficiencies:
 - lower contractor mobilisation and demobilisation costs;
 - lower industry profit margins in return for a secure pipeline of work; and
 - lower costs of delayed and cancelled projects.

³⁰ Heavy vehicle charges – Options for improving the accuracy and stability of the PAYGO heavy vehicle charges Methodology, Discussion paper, June 2016



- Long-term contracting enabling road service providers to make better planning and investment decisions. This could also increase supply chain confidence in making investments.
- It is consistent with promoting a consumer-focused decision-making process, if the BBM is based on robust asset management plans that are tested and reviewed by user bodies (though this benefit could be achieved in other ways.

It may be possible to achieve some of these benefits (such as increased certainty in funding, long-term contracting and consumer focused decision-making) by considering how to modify the application of the PAYGO system. However, this would be a novel and untested approach.

The main benefit of the BBM in helping achieve these benefits is in its practical application. There are a range of well-developed and understood approaches and procedures that have developed around the application of the BBM in Australia that are consistent with promoting these outcomes.

A further benefit of the BBM for the HV road industry relative to PAYGO is that it is compatible with private road funding. The BBM:

- is well understood by infrastructure investors and is consistent with their need for the regulatory framework to have a high-level of predictability and credibility;
- could be well suited to regulated privately-funded roads based on access to share of HV and LV revenues (with possible incremental government or tolls top up funding); and
- could leverage existing institutional arrangements and regulatory frameworks in other industries that underpin investor confidence.

Potential inclusion of an annuity building block

In relation to the renewals' annuity approach, the NTC's 2016 exploratory study concluded that certain road assets in all Australian jurisdictions exhibit characteristics that lend themselves to it. For example, formation assets are typically non-depreciating and demand is expected to remain constant or to increase continually. The NTC noted, however, that:

significant practical issues arise in implementing renewals annuity across Australia for roads. Feedback from jurisdictions is that asset intervention and expenditure are typically well known for only two years in advance. After this time, the picture becomes less clear, primarily because of the Commonwealth budgetary process.

It is possible that a future reform could remove the two-year limitation, and allow road agencies to plan with greater certainty further into the future. Indeed, one of the reform objectives is to achieve this outcome. However, in the interim, and for 'Day 1'



of the FLCB, it is likely that implementing a renewals annuity approach could prove overly complex.³¹

We agree with the NTC's assessment and consider that, if the renewals' annuity approach is applied to limited class of assets, this could be done by adding a renewals' annuity building block into the BBM.

Limitations of applying the **BBM** to a subset of total costs

We note that a possible limitation of applying the BBM to the road industry is that it is being applied to a sub-set of the total cost/service base of road service providers (i.e. for HV services only). This means the efficient expenditure incentives and gains from independent prudence and efficiency assessments realised in other industries may be more challenging to achieve here, or they may give rise to debates about cost shifting or gaming of cost allocations. For example, a road service provider could potentially try to recover costs that are deemed inefficient for HV services by including them in its cost base for LV services. This has the potential to undermine the objectives that introducing a FLCB using the BBM is seeking to achieve.

3.3 Recommendations

We recommend:

- 1. adopting the BBM for the prototype HV revenue model on the basis that:
 - it can be applied to all asset types;
 - it does not require robust long-term asset planning information; and
 - the added complexity of a hybrid BBM-renewals' annuity approach is unlikely to be warranted.
- 2. assuming, for the purposes of the prototype HV revenue model, that there are no "excluded services" that are not covered by the BBM. The potential for service classification is a second order issue that can be considered at a later stage; and
- considering, as part of any future implementation of the FLCB, any proposals from road service providers to adopt the renewals' annuity approach for certain assets. This could potentially be done by adding a renewals' annuity building block into the BBM.

³¹ National Transport Commission, National heavy vehicle charges: Adopting a life cycle approach using forward looking costs, Results of exploratory work, June 2016, page 24



4. Proposed form of BBM

This section sets out the proposed forms of BBM for three scenarios:

- Scenario 1 | Price regulation of Government department.
- Scenario 2 | Economic regulation of Government department.
- Scenario 3 | Economic regulation of Government corporation (as a long-term endpoint for reform).

It is possible that future reform could progress through each scenario or alternatively, from scenario 1 to scenario 3.

Section 4.1 overviews the specific form of BBM we propose for each scenario. Section 4.2 discusses long-term reform evolution considerations that may affect the decision made in Scenario 1. Section 4.3 details key elements of the specific form of BBM by scenario in more detail.

4.1 Overview of specific form of BBM by scenario

Figure 7 sets out a high-level overview of the specific form of BBM we propose for each scenario. This overview is discussed below and each building block is discussed in sections 5 to 9.





Figure 7 - Overview of proposed specific form of BBM by scenario

4.1.1 Scenario I - Price regulation of government department

This scenario reflects the first stage of reform agreed by jurisdictions, which is to apply the BBM under price regulation of road service providers organised as government departments. HV charges would be set based on agreed principles and approaches to applying the BBM and the role of the independent regulator would be simply to audit input data to ensure that it is within the scope of the charge setting methodology.

For the purpose of developing the prototype HV revenue model, the initial RAB would be based primarily on the line-in-the-sand approach to be consistent with a transitional price path and cost of capital, and subject to testing against other methods. This is discussed in section 6 below. The projected RAB would be determining using the RAB roll forward model.

The rate of return would be based on the government cost of borrowing; or as an alternative it could be some lower cost of capital to assist in achieving the targeted transition price path. This is discussed in section 5 below.

The depreciation expenditure allowance under all scenarios would be based on straightline depreciation based on the value of RAB and the remaining lives of assets. An alternative could be to use a modified depreciation schedule to achieve a targeted transition price path. This is discussed in section 7 below.



The opex (and capex) expenditure allowance would be based on forecast actual expenditure of the service provider.

Consistent with the intention of price regulation, there would be no focus on defining efficient costs, regulation of service levels; or incentives schemes.

There would be no control mechanism. There would be a true-up mechanism to correct for differences between actual revenue at the end of each period and expenditure, which could be paid either by road users and/or Government. This reflects the fact that a government department has no balance sheet and therefore has a limited capacity to bear any financial risks. This is discussed further in section 8.2 below.

There would be a short control period (i.e. 1-2 years). This is discussed further in section 10.3.3.

4.1.2 Scenario 2 - Economic regulation of Government department

A possible next step is a scenario in which the organisational form for road providers continues as a government department but price regulation evolves to economic regulation (as discussed in section **Error! Reference source not found.**).

This scenario has been included for completeness. Jurisdictions might determine that economic regulation of a government department may not be appropriate and that it would be preferable to move directly to scenario 3.

This means that the regulatory regime will now have a focus on:

- defining efficient, prudent or otherwise recoverable expenditures;
- the regulator scrutinising expenditure proposals to ensure only efficient, prudent or otherwise recoverable expenditures flow through to user charges, or are recovered through CSOs;
- developing and setting agreed service levels;
- monitoring the delivery of agreed service levels, including community service obligations; and
- conducting ex-post evaluation of investments.

The main changes from scenario 1 are as follows:

• Firstly, the cost of capital would be set to reflect the efficient financing costs of a benchmark efficient entity (i.e. commercial rate of return). This reflects that the purpose of adopting an economic regulation framework is to promote economic efficiency. See section 5. The benchmark cost of capital would be based - for simplicity - on a pre-tax WACC approach, which means that there would be no corporate tax building block allowance (see section 5).



- Secondly, opex and capex expenditure forecasts would now be set to reflect the opex and capex required by a benchmark efficient entity to meet the defined service levels rather than the road provider's actual forecast opex and capex (as in Scenario 1).
- Thirdly, there would be a control mechanism, which we recommend would be a revenue cap (see section 8.2). This will require a new building block to account for any correction amount for under or over recoveries against the revenue caps in previous years (although this could also be dealt with through the true-up mechanism under this scenario).

There would continue to be a true-up mechanism to address difference between actual revenue and expenditure, which could be paid by either road users and/or government.

4.1.3 Scenario 3 - Economic regulation of government corporation

This scenario reflects road service providers being restructured so that they become more 'business-like' (e.g. a statutory authority or GOC). This scenario could evolve directly from Scenario 1 or Scenario 2. The main changes from Scenario 2 are:

- Firstly, the true-up mechanism would no longer be required (because the road service provider would now have other means of managing mismatches between revenue and costs in a year including a balance sheet and borrowing capability).
- Secondly, there would be options to introduce incentive schemes (for example, related to service standards) that put revenue at risk and there could be a longer control period perhaps up to 5 years. Incentive scheme mechanisms are discussed in section 9.

Both changes reflect that a road service provider would now have a balance sheet, and some greater degree of independence to access debt financing, which would enable it to bear financial risk arising from variations between the forecast revenues and actual expenditure.

• Thirdly, there could potentially be more sophisticated mechanisms for managing costs risk such as cost pass through or contingent project mechanisms. These mechanisms are discussed in section 8.3.

4.2 Long-term reform evolution considerations for Scenario I

We note that, to our knowledge, there is no comparable experience with such transition considerations in the implementation of similar reforms in other utility sectors in Australia. Price regulation has not been formally adopted in other sectors, (although in some cases regulators have used their discretion in the early stages of regulating an industry to focus on establishing the regulatory regime, and have given less attention to assessing the prudency and efficiency of expenditure). Generally, the entity is already corporatised (or in some cases privatised), with economic regulation being established concurrently or subsequently.

We note that each time a simplification is adopted in Scenario 1 that decreases the building block model revenues, this creates a potential future price shock or RAB revaluation issue in any later move to Scenarios 2 or 3. Examples include, adopting a government borrowing cost of capital, or not compensating for company tax in Scenario 1.

We suggest that these transitional issues could be modelled and the implications better understood. They may affect, for example, the setting of the initial RAB and policy considerations for future RAB revaluations. There may be a case for adopting a commercial cost of capital from the outset to avoid future price shock, and using depreciation as the lever for achieving price stability during transition.

4.3 Key elements of specific form of BBM by scenario

Table 2 below sets out the scenarios in further detail to enable comparison of the specific form of BBM.



Table 2 - Recommendations on specific form of BBM under alternative scenarios

	Scenario 1	Scenario 2		Scenario 3
Financial policy element	Government department		Statutory authority / GOC	
	Price reg	ılation	Economic	regulation
Key assumptions				
Financeability risk - Matching revenues and costs	Required if road service provider cannot sustain significant revenue shortfalls/cost overruns over several years		Not required if road service provider has a balance sheet and borrowing capacity to sustain revenue shortfalls/cost overruns over several years	
Transition price path	Require reasonably stable and predictable rate of change in HV charges over transition period. Note – Need to decide price / path revenue target and length of transition period, including when transition ends		Apply building blocks model without reference to impacts on average HV charges (because this is the end state of transition not a transition state)	
Building block components				
Cost of capital / rate of	- Government cost of borrow	ing; or	Commercial cost of capital.	Commercial cost of capital
return	 Lower cost of capital to acl path 	nieve targeted transition price	Note – If not considered in setting Initial RAB then when introduced this may either increase prices or trigger need for revaluation.	
Initial RAB	Base case is line-in-the-sand approach, consistent with transitional price path and cost of capital but consider zero RAB with brought-forward revenue approach.		Retain option for one-off RAB revaluation.	
	Note under line-in-the-sand approach:			
	 Requires modelling to ensure set at desired levels. 			
	 Deprival value and optimised depreciated replacement cost approaches are alternatives, but do not provide flexibility to 'goal seek' transition price path. 			

	Scenario 1	Sce	nario 2	Scenario 3
Financial policy element	Government department			Statutory authority / GOC
	Price reg	ılation	Economic	regulation
	 It is still helpful to calculate the rate of change in pricing as asso makers and users. 	e optimised depreciated replacemen et renewals occurs can be understoo	tt cost approach so that the likely and foreshadowed to policy	
RAB roll forward	'Set and forget' approach applyin	ng approved roll forward model		'Set and forget approach' but
				retain option for one-off RAB
				revaluation.
Regulatory depreciation	Straight-line depreciation based on value of RAB and economic and remaining lives of assets. Note – Could use modified depreciation schedule to achieve targeted transition price path			
Opex	Note – all actual opex should be recovered. Note – only forecast prudent and e		Note – only forecast prudent and eff	ficient opex should be recovered.
Corporate tax allowance	Do not include in building blocks model.		Include in building blocks model through pre-tax WACC.	Include in building blocks model through pre-tax WACC. Note – Could move to post tax WACC and have separate corporate tax allowance building block.
Revenue adjustments	Refer below under 'Risk Allocation'			
Risk Allocation				
Revenue / demand risk	 No control mechanism. True-up (for difference betwexpenditure), which could be oroad users and/or Government. 	een revenue and e paid by either:	 Revenue cap control mechanism, with correction factor. True-up (for difference between revenue and expenditure), which could be paid by either: 	 Revenue cap control mechanism, with correction factor. Incentive schemes. Note - If the organisational form changes:



	Scenario 1	Sce	nario 2	Scenario 3
Financial policy element	Government department		Statutory authority / GOC	
	Price regu	ılation	Economic	regulation
			 road users and/or Government. Note – could apply alternative control mechanisms, such as price cap. 	 No need for true-up because don't need to match road service provider's revenues and costs. Could apply alternative control mechanisms, such as price cap. Could introduce incentive schemes that put revenue at risk.
Cost risk	 Short control period (i.e. one or two years).³² Insurance (which would be recovered through Opex). Utilise financial reserves (if any). True-up (for revenue and expenditure) paid by road users. True-up (for revenue and expenditure) paid by Government. Require road service provider to achieve off-setting savings. Note - could apply the following, but would add significant complexity with little, if any, benefit: Cost pass throughs with very low, or zero, materiality thresholds. Contingent projects with very low, or zero, materiality thresholds. 		 [Five] year control mechanism. Balance sheet. Insurance. Cost pass throughs. Contingent projects. Expenditure incentive schemes. Note – If the organisational form changes: 	

³² Section 10.3.3 considers factors relevant to setting the length of the control period. Administrative burden and promoting incentive properties suggests a longer period, while forecasting inaccuracy and immaturity of the regime suggest a shorter period.



	Scenario 1	Scenario 2		Scenario 3	
Financial policy element		Government department		Statutory authority / GOC	
	Price reg	ulation	Economic	nic regulation	
				 No need for true-up because don't need to match revenues and costs. Could start to rely on cost pass throughs and contingent 	
				 projects to manage cost risk. Could lengthen the control period. Could introduce incentive schemes that put revenue at risk. 	
Service risk	 Service definitions. Performance reporting and 	monitoring.		 Service definitions. Guaranteed service level (GSL). If workable, service incentive scheme (that puts revenue at risk). 	
Price risk	 Could achieve transition price p Setting initial RAB using lir Adjusting cost of capital. Adjusting depreciation allow Imposing side constraints. Allowing CSO payments. 	ath by: ne-in-the-sand approach. vance.		 Continue to apply: Side constraints. Pricing principles. CSO payments. 	

5. Return on capital and tax

5.1 Introduction

This section discusses principles for determining the return on capital and any allowance for corporate income tax; and the specific cost of capital to be adopted for setting the return on capital allowance as part of the prototype working model. It is directly relevant to the HV revenue principle proposed in section 2.3 that "A regulated road service provider business should have a reasonable opportunity to recover at least the costs of providing HV services, including earning an appropriate rate of return on the unrecovered cost of capital expenditure". Our recommended approaches to determining the cost of capital differ under price regulation and economic regulation.

The cost of capital ³³ is complex and is often the most contentious area of price or economic regulation because it can be the single largest contributor to building block revenues. Therefore, this section focuses on cost of capital and corporate income tax advice appropriate for establishing a brand new regulatory framework, rather than on the detailed areas of contention experienced within established regulatory frameworks, such as that facing Australian energy networks and their regulators.

5.2 The role of the return on capital building block

The return on capital building block compensates the asset owner for the costs of financing investment in the assets used to provide HV road services. Together with the depreciation allowance (see section 7), the return on capital ensures that the asset owner can recover the full costs of that investment.

The return on capital allowance in each year for a road service provider will reflect the financing costs on the undepreciated assets at that point of time – as reflected in the RAB (see section 8) – and is calculated by multiplying the cost of capital by the value of those unrepaid assets. The return on capital will, therefore, change over time as the RAB and cost of capital change.

5.3 Return on capital under price regulation

As discussed above, under price regulation, the intention is to determine revenues and HV charges based on actual costs *without* an objective to promote economic efficiency. On this basis, we consider that the cost of capital should be based on reasonable estimates by an appropriate decision maker of the *actual* costs of capital that apply to

³³ The financing rate used to calculate the return on capital allowance – i.e. return on capital = cost of capital x capital base.

road service providers operating as government departments. This should reflect relevant government financial policies and practices.

In discussions with stakeholders there was broad agreement that it was reasonable to use the state governments' costs of borrowing. There would be no basis for including an allowance for the payment of corporate income tax within the BBM, as government departments do not pay such tax.

The next step to implementing this approach would be to determine the appropriate decision making process for determining the return on capital – which we consider will require involvement from state, territory and Commonwealth treasury departments.

We note however the point made earlier in section 4.2, that each time a simplification is adopted in Scenario 1 (price regulation of a government department) that deflates the building block model revenues, this creates a potential future price shock or RAB revaluation issue in any later move to Scenario 2 or 3. There may therefore be a case for adopting a commercial cost of capital from the outset to avoid such issues.

5.4 Return on capital under economic regulation

5.4.1 Overall

Under economic regulation, the cost of capital should be set to reflect the efficient financing costs of a benchmark efficient entity. Using a benchmark – rather than an actual – cost of capital to determine the return on capital:

- protects users from paying prices that reflect a return on capital that is excessively high;
- if road providers become more business-like, helps promote economic efficiency by incentivising road providers to match or outperform that benchmark by adopting more efficient financing practices; and
- ensures investment decisions at the margin appropriately consider the market costs of financing to support efficient capital allocation in our economy between available investment options.

When designing a regulatory framework for setting a benchmark cost of capital there are three broad dimensions to consider, as outlined in Table 3. Some of these could be covered by that framework, while others could be delegated to the regulator to resolve.



Dimensions	Discussion	Example choices
1. Principles and decision making	The starting point is to determine the principles that should guide the setting of the cost of capital and who should make decisions about it. For instance, at one extreme a cost of capital could be hard-coded into the regulatory framework that the regulator must use, while at the other extreme an objective and some broad principles could be specified for the regulator to apply at its discretion.	 What, if any, over-arching objective or guidance should apply to setting the cost of capital How much discretion should the regulator have when setting the cost of capital
2. Approach	The next step is to determine what approach to take to estimate the cost of capital, including what benchmark it should reflect and what formula should be used – see Box 8 and Box 9 below respectively for a discussion of both concepts.	 What benchmark should be used to determine that cost of capital How to deal with tax (i.e. pre-tax versus post-tax cost of capital) How to deal with inflation (i.e. real versus nominal cost of capital) Whether and how to promote stable cost of capital estimates
3. Estimation methods and data sources	Once an approach is determined, the final step is to choose the estimation methods, financial models and data sources to apply it. There are a wide range of choices here that can be the subject of significant debate in other sectors and across jurisdictions. These should be considered further in the second stage of work on the FLCB.	 What estimation methods and financial models to use to estimate the cost of capital What data or other information to use when applying those methods and models What, if any, cross-checks should apply to estimates Should any bias be introduced to offset the asymmetric risk to customer outcomes of setting the cost of capital to low

Table 3 – Setting the cost of capital

Box 8 - Specifying a formula

A benchmark cost of capital is often estimated using a weighted average cost of capital (WACC) formula that can be specified in either pre- or post- tax terms and in real or nominal terms. These terms are defined as follows:

WACC – is the weighted average cost of capital, and is the average rate of return that a company expects to compensate its investors for providing the funds needed for investment. Typically, investors are grouped as either debt or equity holders, with a required rate of return and weight assigned to each – each form separate WACC parameters. The weight applied to the return on debt is referred to as leverage or gearing.

Pre-tax WACC – is a WACC where the rates of return to debt and equity holders are before tax is removed.



Post-tax WACC – is a WACC where the rates of return to debt and / or equity holders are after tax is removed. There are also two key variants:

- one where the rate of return to equity holders is post-tax, while the rate of return to debt holders is pre-tax (often referred to as a 'vanilla WACC'), and
- the other where both returns are post-tax.

Nominal WACC - is a WACC that includes the cost of expected inflation.

Real WACC - is a WACC where forecast inflation is removed.

The choice between a real and nominal WACC is directly related to how the depreciation allowance is calculated – see section 7.6; while the choice between a pre- and post- tax WACC is directly related to how tax is compensated for in BBM – see section 5.4.2.

Box 9 – Defining the benchmark

To determine a benchmark cost of capital under economic regulation it is necessary to specify the 'benchmark' being estimated. For instance, it could be for a government-owned entity or department, or a privately-owned entity. It could also be for an entity that operates in a single market, or one that provides a range of services across multiple markets.

As such, it is necessary to define the characteristics of that benchmark, including:

- The form of ownership is the entity government-owned or not or is it part of a corporate group.
- Whether the entity competes with other entities within certain markets including the extent of any competition between road and rail in the freight haulage market.
- The services provided which is likely to affect the risks faced and the investment horizon.
- The markets in which the entity operates does the entity operate within a given state, Australia more generally, or internationally?
- Whether it is subject to economic regulation or not (or effective competition or not) which may affect the risks factored into the cost of capital and the assumed financing practices used to determine it.

An additional consideration might be whether in the long-term it is possible that there could be private ownership of road assets that are regulated on a consistent basis with publicly-owned road service providers.

Some regulatory frameworks provide the regulator with discretion to define the benchmark (e.g. energy network regulation in Australia); however, others specify this directly or do not deal with it at all.

Even if the regulated entity does not face a commercial cost of capital (such as a government department), it may still be appropriate to adopt a commercial

benchmark (such as a privately-owned comparator) to set the right incentives when making investment decisions or to satisfy competitive neutrality obligations (as private sector competitors will likely face a commercial cost of capital and pay corporate income tax).

The relationship between the actual cost of capital faced by a road service provider and the benchmark cost of capital depends on relevant jurisdictional policies. We understand that some jurisdictions seek to align the actual cost of capital faced by corporatised businesses to some extent with an estimate of the benchmark cost of capital. Mechanisms applied include charging of guarantee fees for debt or on-lending of debt at a margin over the jurisdictions borrowing cost.

5.4.2 Allowance for corporate income tax

Compensation for corporate income tax is factored in to the standard BBM in one of two ways:

- **Pre-tax modelling** where the cost of capital is grossed up to include an assumed cost of corporate income tax (i.e. a pre-tax WACC) and reflected in the return on capital allowance.
- **Post-tax modelling** where the cost of corporate income tax is included as a separate building block and calculated using forecast taxable revenue and expenses, rather than in the return on capital allowance (i.e. which is calculated using a post-tax WACC).

The first approach is the simplest to implement, and is often adopted by jurisdictions when they first adopt economic regulation (e.g. energy network regulation in NSW by IPART). However, under either approach, some adjustment is generally made for the assumed value that shareholders get from the imputation credits generated when corporate tax is paid.

As with the cost of capital, under economic regulation the cost of corporate income tax reflects a benchmark cost, rather than an actual cost. This ensures that the entity subject to economic regulation faces incentives to operate efficiently.

5.4.3 Resetting cost of capital and price stability

As discussed above, we expect there will be policy objectives to promote price stability over time. Resetting the cost of capital periodically can introduce volatility into modelled prices, noting that the return on capital building block is typically a significant component of total revenues and prices. One means by which price stability can be promoted is to use estimation methods and financial models that promote more stable



prices over time³⁴. One example is to use a trailing average return on debt estimate as an input into the WACC, although there are also other options.

5.5 Assessment

There are different ways in which the cost of capital can be included in the prototype HV revenue model, but it will be relatively easy to model different approaches to the cost of capital. This means that from both HV charges' design and modelling perspectives it is not necessary to make early decisions on the cost of capital. Different cost of capital approaches can be modelled as required, and we recommend that these are considered as part of the second stage of work on the FLCB.

The preferred cost of capital will depend on whether price regulation or economic regulation applies.

If the former, then the cost of capital could reflect actual financing costs or alternatively (see below) some other transitional measure to achieve desired price outcomes and to only compensate for corporate income tax if the road provider pays such tax (which is not so for government departments).

If the latter, then to promote an economic efficiency objective it is appropriate to use a benchmark cost of capital and allow recovery of benchmark corporate income tax.

However, irrespective of which form of regulation applies, there is benefit in taking a long-term principled approach at the outset to determine the cost of capital, rather than to simply reflect the current ownership structure of road service providers. A long-term principled approach will help facilitate future reform of the sector (which could take some time and may depend on the degree of competition from other forms of transportation), as well as align with how price and economic regulation applies in other regulated sectors.

5.6 Implementation and transition considerations for setting the return on capital

As discussed above, in the transition to implementing the BBM under a FLCB, an additional objective may be to support transitional price path objectives. For example, a lower cost of capital could be adopted as one means of achieving the defined price path. One option for achieving this could be to continue to apply the government borrowing rate to the legacy RAB and only to apply a commercial cost of capital to the new investment that occurs after the introducing of economic regulation. This is consistent with a view that sunk investments should only return the government cost of borrowing

³⁴ Other ways of promoting price stability is through choice of the depreciation schedule (See section 7 below).



but new investment decisions should be based on the market costs of financing to provide efficient capital allocation between available investment options.

5.7 Recommendations

We recommend:

- 1. Both an actual and a benchmark cost of capital be modelled for the second stage of work on the FLCB to allow assessment of both options, noting that the latter may better promote economic efficiency.
- 2. The return on capital under price regulation should be based on reasonable estimates of the actual costs of capital that apply to road service providers operating as a government department and reflect relevant government financial policies and practices. We note, however, that applying a government cost of borrowing in Scenario 1 creates the potential for a future price shock in any later move to Scenarios 2 or 3.
- 3. The return on capital under economic regulation should be:
 - set to reflect the efficient financing costs of a benchmark efficient entity; and
 - based on the benchmark cost of capital using a pre-tax WACC for simplicity, but potentially moving to a post-tax WACC in future.
- 4. If a pre-tax WACC is used then it is grossed up to include an assumed cost of corporate income tax and there is no separate corporate income tax building block. If a post-tax WACC is used then the assumed cost of corporate income tax is included as a separate building block that is calculated using forecast taxable revenue and expenses, rather than in the return on capital allowance.
- 5. Noting that an option for achieving the transitional price path could be to continue to apply the government borrowing rate to the legacy RAB and only to apply a commercial cost of capital to new investment that occurs after the introduction of economic regulation.
- 6. Next steps in determining the cost of capital under economic regulation are to:
 - develop guiding principles or objectives (see Table 3 above); and
 - consider implementation issues such as how to define the benchmark and what estimation methods, financial models and data to use.

6. Initial regulatory asset base

The valuation of existing assets – the Initial Regulatory Asset Base (RAB) – is one of the most important policy decisions to be made in transitioning to a FLCB.

As discussed in section 2.4 and Appendix C, our proposed 'full market expenditure' approach involves: developing an initial HV RAB as part of the current reform; developing a separate initial LV RAB at the time any future LV reforms are undertaken; attributing or allocating shared expenditure between HV and LV; and then developing a standalone HV cost base and HV ARR, to develop HV charges.

Our recommended approach for the initial HV RAB was developed by first considering the experience of regulated Australian industries in setting the initial RAB value, where there is a constraint on the future price path (see section 2.7.1). Next, we tested this approach for the situation where a proportion of the assets have been paid for up-front by users (see section 2.7.2). Then we developed our overall assessment of options based on defined criteria and developed our recommended way forward.

Section 6.5 deals with the question of whether the road network should be broken into smaller networks in setting the RAB.

6.1 Experience in setting the Initial RAB regulated Australian industries

Appendix A sets out the experience of other regulated Australian industries of setting the initial RAB value. There are three main approaches that have been used, being:

- 1. deprival value approach³⁵;
- 2. optimised depreciated replacement cost (ODRC) approach³⁶;
- 3. line-in-the-sand approach.

The **deprival value approach** represents the opportunity cost incurred if an entity were to be deprived of the service potential, or the future economic benefit, of the assets. The deprival value is defined as being the lesser of:

- ODRC (see below); and
- the economic value of the asset, which is calculated as the maximum of:
 - the net present value of the future cash flows; and
 - the net realisable value from selling the assets for their scrap value.

³⁵ There is one example of the use of Optimised Deprival Value approach (See Appendix A)

³⁶ Also called Depreciated Optimised Replacement Cost (DORC).



There are a few cases in Australian regulatory practice where the deprival value approach has been used explicitly. Australian regulatory practice has, however, primarily adopted either of the other two approaches, both of which are consistent with the two 'limbs' of deprival value approach.

The **ODRC approach** is a forward-looking cost based valuation method. ODRC has been widely used in setting initial RABs for energy network businesses. In Australian regulatory practice, there are two steps in calculating the ODRC value:

- Step 1 estimate the cost of replacing the existing asset with an optimally configured (and sized) new asset that is constructed using modern engineering equivalent materials (the optimised replacement cost (ORC)); and
- Step 2 account for differences in the service potential and costs of operating the existing asset and the optimised asset by 'depreciating' the ORC on either a straight-line basis or on a net present value basis.

The ODRC method is considered by most economists to produce prices that are consistent with outcomes expected in a workably competitive market and that do not include monopoly rent. This view has been supported by Australian courts.

The line-in-the-sand approach is based on calculating the economic value of the initial RAB based on achieving certain price, revenue or return objectives. It is consistent with the economic value limb of the deprival value approach. It breaks the 'circularity problem'³⁷ by imposing an external policy constraint on prices or revenues and uses this to calculate the initial RAB. This approach has been widely used in setting the initial RAB for Australian water businesses.

Appendix A also discusses other valuation approaches and the reasons these approaches do not appear suitable in the case of setting a FLCB for HV road services:

- 4. depreciated historic cost; and
- 5. valuation based on recent transactions.

6.2 Long-term RAB convergence

A notable feature of the long-term operation of the BBM is that, regardless of the approach used to set the initial RAB, over time the RAB will converge towards the same value.

This is because over time, the value of the original assets will become a smaller proportion of the RAB (as they are depreciated) and the value of new assets (which are

³⁷ The 'circularity problem' is the problem that arises where the level of prices for a monopoly asset depends on the initial RAB value; but this the RAB initial value may depend in turn on the future level of the prices.



added to the RAB at the same value) will become a larger proportion of the RAB. This feature is illustrated in Box 10.

A related feature of the BBM is that the larger the write down of the initial RAB, the higher will be the rate of annual increases in the RAB value, particularly in the early years, which in turn will flow through to a higher rate of increases in charges. This is also shown in Box 10.

We note that, given the long-lived nature of road assets, this convergence should happen relatively slowly.

Modelling for particular road service providers using the proposed prototype HV revenue model and realistic data (in particular, asset life assumptions and indicative long term capital expenditure projections) would enable projections for long-term asset value; and the rate of change in prices under different options to be understood.



Notes: Initial RAB value on ODRC basis is \$100; on line-in-the-sand is \$50; Annual capital expenditure is \$5; Straight-line depreciation; Asset life is 20 years.





As discussed in section 2.7.1, this report assumes that the financial policy elements for the FLCB be set to support a reasonably stable and predictable rate of change in HV charges over a transitional period.

For setting the initial RAB value, we assume that this specifically means that there should not be any significant 'price shock' for HV users, on average. Defining the exact transition approach (e.g. the rate of change in prices, the duration of any transitional constraint) would be an important matter for detailed subsequent policy consideration.

Research undertaken by the NTC has identified that:

- (as noted in section 2.7.1 above), the depreciated replacement cost (DRC) values for all road assets (used for both HV and LV services) in all jurisdictions were approximately \$199.1 billion³⁸; and
- the initial RAB values to achieve a 'transition goal' required a significant reduction in the initial RAB, implying that if DRC was adopted then this would result in a significant increase in revenues and HV charges.

We note that the NTC advised that there may be limitations in the information they obtained from the road service providers for their work.

Taking account of experience in Australian utility regulation, and on the basis that the information relied on by the NTC and its analysis is approximately correct, (and

³⁸ We understand that there has been no attempt to calculate aa Optimised Depreciated Replacement Cost. We expect that this would be a very difficult task to undertake.

ignoring the issue of users having already paid for assets) we conclude that the initial RAB value could primarily be based on the 'line-in-the-sand approach'.

However, the indicative initial RAB valuations produced by the line-in-the-sand method should also be tested against estimates of the ODRC alternative³⁹ to ensure the approach does not 'lock-in' an initial RAB that is either:

- inappropriately low given the historical circumstances or future cash flow needs of the road service providers; or
- inappropriately high such that it would be seen to lock-in monopoly returns calculated against an objective standard (for example, that it does not produce an initial RAB valuation that might exceed ODRC).

Also, it is still helpful to calculate the ODRC approach so that the likely rate of change in pricing as asset renewal occurs can be understood and foreshadowed to policy makers and users.

Finally, we note that relying primarily on this approach has the advantage of relative simplicity.

6.3 Assets paid for by users under PAYGO

This section considers the approach to setting the initial RAB where a proportion of capex attributable to HV services has been paid for up-front under the existing PAYGO model, and there is a policy position to explicitly take this into account.

Users' potential 'double-counting' concern

As noted above, for our analysis we have adopted a simplified assumption that under PAYGO all HV assets have been paid for up-front by HV users, but note that this assumption needs to be tested.

From a HV user's perspective, there may be a concern that the transition to a FLCB using the line-in-the-sand valuation may result in some 'double counting' of payments made for capex: (i.e. payments made once under PAYGO, and some additional payments for the same capex under the BBM). It is possible that a user could argue that the PAYGO is effectively expensing all capex in the year that it is incurred and accordingly the initial RAB should be set at zero. This approach is in effect the depreciated actual cost (discussed in Appendix B).

However adopting this approach would cause the price path to fall to a very low level and then rise rapidly in subsequent years. This is illustrated in Panel A of Figure 8 below. From an economic perspective, this price path profile would likely cause distortions as it would provide a large short-term pricing benefit to the road freight

³⁹ As actual ODRC valuations may not be available, then high level estimates of ODRC valuations could be determined. The feasibility and usefulness of making such estimates requires further investigation.



industry, followed by a rapid rise in HV charges. This does not mimic what would be expected to occur in a workably competitive market, where it would not be expected prices would change substantially due to a change in pricing methodology. From a policy perspective, it is not consistent with the desire to maintain a stable price path, and it is unlikely to make sense to policy makers or users. For these reasons, we recommend against adopting a zero RAB approach.

The next section discusses how a zero RAB approach could be implemented while achieving a smooth transitional price path.

Implementation under a zero RAB approach

As noted in section 3.1.1, one way of thinking about the BBM is as a tool for shifting cost recovery over time. At its core, the RAB is an account for costs that have not yet been recovered from customers; however, it can also be used as an account for costs that have been recovered but not yet incurred.

For instance, standard regulatory practice is to use the RAB to recover expenditure on assets over the lives of those assets, shifting recovery from now into the future. However, that same logic can also apply to bringing forward cost recovery, where future revenue is brought forward and added to current allowed revenue and is offset by a negative adjustment to the RAB. This logic has been used by some regulators to overcome challenges faced by regulated businesses financing their required activities.⁴⁰

This RAB adjustment is treated like negative capital expenditure that is then paid off by the business in future years via lower return on and of (i.e. depreciation) capital building blocks – and therefore allowed revenues and prices. Using the RAB in this way ensures that the revenue uplift now, and repayment in the future, is NPV neutral so that customers in aggregate are no worse off.

This same logic can be used to overcome short term price and revenue volatility that would result from adopting a zero RAB approach (without adjustment), whereby:

- **revenue uplifts** are provided within the BBM over the first few years of the new regulatory framework to ensure that allowed revenue and prices transition from their current levels, and
- these uplifts are added as **negative capex** to the RAB in the year that they are allowed, which are then paid back over time through the return on and of capital building blocks.

The level of the revenue uplifts and the assumed period for paying them back (i.e. the assumed asset life) will need to be calibrated to deliver the revenue and price smoothing

⁴⁰ See, for instance, Ofwat, *Finceability and financing the asset base – a discussion paper*, November 2015, section 4.3.3, http://www.ofwat.gov.uk/wp-content/uploads/2015/11/prs inf1103fpl financeability.pdf.

outcomes sought and based on expected future expenditure needs – and will likely differ by network.

Figure 8 illustrates how this might apply, with the first panel (A) showing the BBM without revenue smoothing and second panel (B) with smoothing. In the second panel, the orange shaded area represents the revenue uplift, while the green shaded area is the repayment of that uplift – and the two areas set equal in NPV neutral terms.

Figure 8 - Illustration of revenue smoothing







B: Building blocks model with revenue smoothing

6.4 Assessment and way forward

The following is our overall assessment of options and the way forward for setting of the initial RAB.

We have identified the following options:

1. Line-in-the-sand approach



- Farrier Swier Consulting
 - 2. Zero RAB with brought-forward revenue (as per section 6.3 above)
 - 3. Negotiated outcome some pragmatic approach considered reasonable to users.

We have considered the following criteria:

- 1. Supports price stability;
- 2. Simplicity;
- 3. Efficiency;
- 4. Consistent with regulatory practice; and
- 5. Perceived as fair by users.

Table 4 sets out our assessment of the first two options.

Table 4 - Assessment of l	ine-in-the-sand and	zero RAB wit	th brought-forward	revenue
adjustment approach				

Criteria	Line-in-the-sand	Zero RAB with brought-forward revenue adjustment
Supports price stability	Yes	Yes
Is simple	Relatively simple in concept.	Conceptually simple if apply brought- forward revenue adjustments and negative capex.
Promotes efficiency	Yes	Yes
Is consistent with regulatory practice	Yes	Yes, provided that results in NPV neutral outcome
Precedents	Numerous precedents in Australia.	No precedents in Australia
Perceived as fair by users	If initial RAB is based on projecting a 'status quo' price path (as if the PAYGO method was to continue for a given period of time) then users can be satisfied that they are not paying any more overall for a given transition period. However, there would not be any specific assurance that there was no double counting of capital paid for under PAYGO for charging purposes. There is flexibility in setting the projected price path which lends itself to a negotiated outcome.	Yes, although could be inter- generational equity issues by bringing forward revenue recovery

6.5 Should a jurisdictional road network be broken into small networks in setting the RAB?

This section deals with the question of whether a jurisdictional road network should be broken into smaller networks in setting the RAB. We considered the following factors:

- Application of pricing principles.
- How regulated businesses typically restructure charges.
- Policy reasons why governments might wish to break up a network and to allocate the RAB value into smaller network.

Our conclusion is that from a charging perspective there is no reason for the government to make a centralised decision to break up a road network into smaller networks with separate RABs. A single road network could have flexibility to allocate costs in different ways, to achieve any desired economic or policy outcome⁴¹. Therefore, breaking up the network is not necessary to provide this flexibility. However, there may be broader policy reasons why a government may wish to break up a road network, such as to achieve distributional outcomes or to set up different incentives for various parts of the road network to achieve different outcomes.

Application of pricing principles

The application of standard pricing principles from other regulated industries suggest it is not necessary to require the HV RAB to be allocated to different types of roads (e.g. urban and remote and rural) to calculate HV changes. Box 11 sets out possible HV pricing principles, which align with pricing principles for other regulated industries. Essentially, efficient infrastructure pricing is forward looking and is concerned with reflecting marginal costs and recovering the remaining costs in a way that minimises economic distortions.

Box 11 - HV pricing principles

HV pricing principles developed as part of the earlier reform work include:

- HV prices should reflect marginal costs.
- HV prices set at marginal costs will generally not recover the total HV cost base.
- Options for collecting total costs include multi-part tariffs that would include both fixed and variable rates or inverse elasticity (Ramsey) pricing that would

⁴¹ Consider the following examples: (1) There is a decision to apply congestion charging for HV services in congested urban roads but not for non-urban roads. (2) There is a decision to implement incremental access, where HV users pay the incremental costs to meet the cost of being provided a higher level of access. In both these examples, there would be no constraints on a single road service provider being able to implement such charging schemes.



apply variable markups on usage rates, with the highest mark-ups placed on services with the least elastic demand. $^{\rm 42}$

Other pricing principles to consider include stability, predictability, that uses can understand and will respond to the prices.

How regulated businesses typically restructure charges

Over time, there may be a desire by a road service provider, government or the economic regulator to move towards more cost-reflective pricing whereby differences in the cost of supply for particular services are reflected in more disaggregated prices. These services could be defined by location or road function.

A regulated business typically develops more disaggregated charging structures by building a charging model with cost categories, and allocates costs to these categories in a way that best supports a particular charging strategy and is consistent with any relevant (externally imposed) pricing rules. We assume that road service providers that wish to introduce more disaggregated pricing would follow this approach.

If each road network is maintained as a single entity, then decisions can be made at any time (subject to any regulatory or policy constraints) to create, or amend the charging strategy and the underlying cost allocation models to align with the desired pricing outcomes.

Therefore, from a pure charging perspective there is no reason for the government to make a centralised decision to break up the road network into smaller networks. A single road network could have flexibility to allocate costs in different ways and breaking up the network is not necessary to provide this flexibility.

Policy reasons why governments might wish to break up a road network and allocate the RAB values

In our experience, there may be policy reasons (unrelated to charging) for why governments might wish to break up a network and to allocate the RAB value into smaller networks.

⁴² Ramsey pricing is not widely used in practice. An example of where Ramsey pricing concept have influenced pricing practices in electricity (and gas) transmission charging are the provisions for prudent discounts. (see Rule 6A.26, National Electric Rules). A transmission company is permitted to provide a discount to a price sensitive customer (for example to retain the customer on the network) and recover the discount from less price sensitive customers.



One reason would be to achieve a distributional impact on future charges, and to 'lock these in'. ⁴³ Another may be to give different incentives to the road service provider to achieve different outcomes in different parts of the road network. This could be the case, for example, for dense metropolitan / urban areas as opposed to dispersed rural / regional areas. ⁴⁴

6.6 Recommendations

- 1. We recommend that the initial RAB for the prototype HV revenue model be established as follows:
 - Jurisdictions should determine whether there should be a constraint placed on the rate of change of the price path for HV charges.
 - Noting the limited NTC analysis undertaken, the 'base case' initial RAB value should primarily be based on the line-in-the-sand approach to be consistent with the specified price constraint and the cost of capital.
- 2. Analysis should be undertaken in the second stage of work on the FLCB to test the outcomes of the line-in-the-sand approach by:
 - undertaking scenario analysis of different plausible price or revenue paths that could be consistent with the government objective. This would inform decision makers of trade-offs between user and shareholder outcomes;
 - undertaking scenario testing of initial RAB values by varying the cost of capital and the depreciation profile.
 - testing that the approach does not 'lock in' an initial RAB that is either:
 - inappropriately low given the historical circumstances or future cash flow needs of the road service provider; or
 - inappropriately high such that it would be seen to lock in monopoly returns calculated against an objective standard.
 - undertaking analysis of the long-term price and revenue path (noting that the larger the write down of asset value under the 'line-in-the-sand' approach, the higher may be the rate of change in prices needed for the long term RAB value to converge the long-term equilibrium value).
- 3. Further consideration should be given to the zero RAB with adjusted revenue approach if there is a view that users may be concerned about the potential for double counting noting that it has not been developed or assessed in detail

⁴³ For example, if a government wished to provide certainty to a regional area (that has a high cost of supply) that its location-based charges would not rise in future, then one way it could achieve this would be to define a regional 'roading zone' for that region, and set a lower initial RAB for that zone. We note that there may be other and perhaps better ways to achieve this outcome, such as through the use of explicit side constraints on the movement in prices.

⁴⁴ These incentives could relate to matters such as: (1) Meeting demand on the road network, and so complement pricing signals given to road users; or (2) Distinct issues, such as road safety, growth in the road network or expenditure programs that relate to particular parts of the road network.


- 4. In regard to determining an approach to setting the initial RAB that will be seen as reasonable to users:
 - understand likely user perceptions in setting the initial RAB; and
 - note that line-in-the-sand approach has flexibility to base it on a price path seen as acceptable to users.
- 5. In regard to whether to break-up a road network into smaller networks with separate RABs we consider that:
 - from a charging perspective, there is no reason for taking such action; and
 - there may be broader policy reasons why it would be desirable to break up a road network to better support achieving certain outcomes desired by governments.

7. Depreciation

7.1 Introduction

This section discusses and recommends the basis for determining the regulatory depreciation building block (otherwise called the 'return of capital') and the specific depreciation schedule (real straight-line depreciation) as part of the prototype working model.

The profile of regulatory depreciation determines only the time profile of tariffs over the life of an asset, and does not change the value of the resulting revenue stream (in present value terms). This means there are several different depreciation methods that can be adopted. The choice between methods, and therefore profiles, depends on the importance attributed to principles such as economic efficiency, intergenerational equity and price stability discussed in section 2, and whether the deprecation building block is being used as a transition management tool for HV charges.

As noted above, this section does not consider implications for depreciation practices for the purpose of statutory accounting.

7.2 The role of the depreciation building block

Depreciation applies to long-lived assets that are consumed or depleted in the provision of services. Depreciation generally does not apply to assets, such as land, that are not consumed. Land is discussed further in section 10.4.5.

The depreciation building block allowance is provided in each year so that the asset owner recovers its investment over the economic life of the asset. Depreciation is deducted from the RAB each year as it is recovered through the BBM's regulatory depreciation allowance.

The regulatory depreciation allowance in each year for a road service provider will reflect the contribution of a portfolio of assets, all of different vintages, rather than a single asset. It is important to have assets depreciated over their respective lives, so that the depreciation allowance provides cashflow in sync with the timing of the service provider making its replacement investments. Figure 9 illustrates this.



Figure 9 - Depreciation illustration



Source: Department for Victorian Communities, Local government: Accounting for non-current physical assets under AASB116 | A guide

The regulatory deprecation allowance should be calculated so that, over time, users pay the depreciation charge only once, and there is no 'double counting' of deprecation paid back to the service provider. Asset lives used for regulatory depreciation should generally align to the equivalent lives used for statutory accounting purposes.

7.3 Making decisions on depreciation

Table 5 proposes an approach to addressing four key questions for determining depreciation charges:

- When would depreciation charges be calculated?
- Who proposes the categories of assets and the depreciation schedule?
- What is the role of the regulator?
- What are the core principles for determining the depreciation schedules?

We have drawn on the National Electricity Rules and National Gas Rules to propose the following arrangements. We consider these to be sensible and straightforward and appear equally applicable for the price or economic regulation of HV services.



Question	Discussion	Recommendation for prototype HV revenue model
When would depreciation charges be calculated?	The depreciation charge for each regulatory year needs to be calculated on the value of the assets as included in the RAB, at a certain point in time. The National Electricity Rules require depreciation to be calculated based on the value of the RAB at the beginning of the regulatory year.	Depreciation to be calculated based on the value of the RAB at the beginning of the regulatory year.
Who proposes the categories of assets and the depreciation schedule?	The Australian Energy Market Commission considers that the regulated service provider is in the best positon to propose the method of depreciation, with the role of the regulator to check compliance with the rules. This approach would also seem to apply to road services.	The road service provider would propose depreciation schedules for each asset or category of assets. We understand there are already well established practices for determining asset categories for the components of a sealed road asset. For example, guidance to the local government application of accounting standard AASB116 cites components of sealed road assets with distinct economic lives as including: road seals – 15 years, pavement components – 60 years, and formation assets as perpetual assets. ⁴⁵
What is the role of the regulator?	In the National Electricity Rules, each deprecation schedule is either accepted by the regulator or is amended if the regulator considers the schedule does not comply with the depreciation principles.	Each proposed deprecation schedule would either be accepted by the regulator or would be amended if the regulator considered the schedule did not comply with the depreciation principles.
What are the core principles for determine the depreciation schedules?	Propose adopting key principles from the National Electricity Rules.	 The depreciation schedules must be depreciated using a profile that reflects the nature of the assets or category of assets over the economic life of that asset or category of assets. The depreciation schedules can be adjusted where there are changes in the expected economic life of a particular asset, or a particular group of assets. An asset should be depreciated only once. The amount by which the asset is depreciated over its economic life should not exceed the value of the asset at the time of its inclusion in the capital base (with this value, adjusted as appropriate for inflation).

Table 5 - Key depreciation decisions

⁴⁵ Department for Victorian Communities, Local government: Accounting for non-current physical assets under AASB116 | A guide, May 2006, p. 14.



7.4 Choice of depreciation approach

7.4.1 Straight-line depreciation – the default profile

Australian regulatory practice favours applying real depreciation with a straight-line profile to determine the depreciation schedule (i.e. real straight-line depreciation). Real straight-line depreciation is by far the most common form of depreciation method for regulatory purposes. It can be characterised as the 'default' depreciation method – the method that is adopted unless there is a clearly preferred alternative. It is generally adopted for the following reasons:

- Intergenerational equity | where benefits arising from an asset are assessed as being spread evenly over time then intergenerational equity is presumed to be promoted by calculating depreciation charges evenly throughout the useful life of asset.
- Administrative simplicity | it is simple to calculate.
- Certainty and consistency | it is a widely-used method and is easily replicable.

Real straight-line depreciation for a given year for a given asset is calculated using the following formula:

Depreciation = <u>Depreciable amount (Fair Value - Residual Value)</u> Useful Life

We are not aware of any reason to assume future users shouldn't pay an equivalent share of the assets as today's users and hence we propose that the prototype model adopt a real straight-line depreciation approach. This assumption could be further tested as any reform progresses.

The choice between real and nominal depreciation is set out in the next section.

7.4.2 Real or nominal depreciation

Depreciation can be determined in either real or nominal terms, with the difference resulting in either front-ending or back-ending the return of capital. If real depreciation is adopted, then that return is back-ended over the economic life of the asset. If nominal depreciation is adopted, then that return is front-ended. These outcomes occur even when using a straight-line depreciation method. The decision to use real depreciation is effectively capitalising inflation costs into the RAB.

Australian regulators have favoured real depreciation because when applying the standard straight-line depreciation approach, it is assumed to better promote intergenerational equity by spreading the real cost of the asset evenly over its useful life, which in effect assumes that future users will value these services as much as today's users. If a nominal depreciation method is used then a dollar of depreciation today will place a higher burden on consumers today than a dollar of depreciation in the future



because of inflation. This may offend the objective of achieving intergenerational equity.

If real depreciation is adopted, then the RAB will need to inflate each year and the value of that inflation adjustment will need to be deducted from building blocks revenue to ensure that full value of the asset is recovered over the life of that asset. Although it does not affect the outcome, that deduction could be reflected in:

- the return of capital building block as an offset to the real depreciation allowance;
- the return on capital building block by using a real, rather than nominal, WACC; and
- a separate *negative* 'RAB indexation' building block.

7.4.3 Economic efficiency considerations for alternative depreciation methods

There are several economic efficiency considerations for why an alternative depreciation schedule (i.e. to straight-light) could be adopted, including:

- price stability;
- the potential introduction of congestion pricing;
- whether flexibility is required to promote efficient growth in demand for services; and
- managing the risk of technology change and competition.

These matters concern the relationship between depreciation and HV charges through time and by location. These considerations are discussed in Appendix B but would need to be investigated further before determining whether they should affect the choice of preferred depreciation method.

7.4.4 Depreciation method as a possible transition management tool

It may be appropriate to consider using the depreciation schedule as a pragmatic transition management tool.

Whatever profile of regulatory depreciation is chosen should not change the value of the resulting revenue stream (in present value terms).

7.4.5 Determining asset classes and asset lives

Under any scenario, there is a need to group assets into classes and to assign economic lives to them.



If, for example, a line-in-the-sand approach is used to determine the opening RAB, a single asset class could be used for all legacy assets (except for land, which is not depreciated) if there is not sufficient historical information available to distinguish between different asset classes. In this case, individual asset classes would only be created for new assets as future capital expenditure is incurred.

Decisions would also be required about assets' economic lives – these decisions have important intergenerational equity implications. If an asset's economic life is shorter than its useful life earlier users pay relatively more than future users, and vice versa.

7.5 Recommendations

We recommend that:

- 1. The prototype HV revenue model adopts the following depreciation principles:
 - a. The depreciation charge should be calculated on the value of the RAB for each asset or category of assets at the beginning of the regulatory year.
 - b. An asset should be depreciated only once. The amount by which the asset is depreciated over its economic life should not exceed the value of the asset at the time of its inclusion in the capital base (with this value, adjusted as appropriate for inflation).
 - c. The depreciation schedules should reflect the nature of the assets or category of assets over the economic life of the assets or category of assets.
 - d. The depreciation schedule should have regard to the following principles:
 - economic efficiency;
 - intergenerational equity;
 - price stability;
 - administrative simplicity; and
 - certainty and consistency.
 - e. The road service provider should propose depreciation schedules and economic lives for each asset or category of assets, having regard for the above depreciation schedule principles. This would allow the road service provider to have regard for the basis on which assets are consumed in its jurisdiction. Each proposed deprecation schedule should either be accepted by the regulator or be amended if the regulator considers it does not comply with the depreciation schedule principles.
 - f. The depreciation schedules should be capable of adjustment where there are changes in the expected economic lives of particular assets.
- 2. The potential for the depreciation schedule to be used as a tool for facilitating transition management for HV charges be noted, and that this be considered in the second stage of work on the FLCB or in later work.



3. For the prototype HV revenue model, the depreciation schedule for each class of assets should be calculated using the straight-line depreciation method determined in real terms.

8. Managing revenue and cost risks

Risk allocation is an important financial policy aspect of the design of economic regulation arrangements. This section sets out a high-level overview of risk allocation considerations. It then examines arrangements for managing revenue and cost risks.

8.1 Overall risk allocation framework

When two parties trade a service, they both make choices about bearing certain risks and charge or pay based on their risk preferences. Where this transaction is regulated (either through price regulation or economic regulation), the government(s) setting the regulatory regime must decide the risk allocations and magnitude of risks borne by each party, and then give effect to this through the regulatory regime. Generally, a risk is assigned to the party best placed to manage it. In the HV context, there are three possible risk bearing parties: road users, road service providers and governments.

A road service provider's revenues will be calculated based on the BBM and forecast expenditures. This gives rise to four broad types of risks, as shown in Table 6^{46} . Table 6 also:

- summarises the range of mechanisms for managing risks;
- identifies whether each type of risk is addressed under price regulation and economic regulation; and
- details where each type of risk is discussed in this paper.

Table 6 - Components of risk framework

Type of risk	Description	Potential mechanisms for managing risk	Addressed in price and economic regulation?	Section in this report
Demand risk	Risk that actual future demand (for example, forecast of HV trips) will differ from forecast.	– Control mechanism	Yes, both price and economic regulation	8.2
Cost risk	Risks that the actual future cost of providing agreed services differ from forecast. This includes project risk related to uncertainty about aspects of a major project (e.g. a new highway) such as, whether it will proceed in the	 BBM treatment of capital Balance sheet Insurance Pass throughs 	Yes, both price and economic regulation	8.3

⁴⁶ It is assumed that safety risks are Safety risks are dealt with through separate (non-economic) regulatory arrangements, although road service providers will include the prudent and efficient costs of meeting safety obligations in their expenditure plans.

Type of risk	Description	Potential mechanisms for managing risk	Addressed in price and economic regulation?	Section in this report
	next period; its design; its costs, etc.	Contingent projectsIncentives		
Service level risk	Risk to users that service levels will be less than some agreed or acceptable level.	 Reporting Guaranteed service levels Service incentives (rewards /penalties) 	No, only Economic Regulation	9.3
Price risk	Risk to users of significant variation in prices / price shock / unacceptable prices	DepreciationSide constraintsCSOs	Yes, both price and economic regulation	2.7 and 6

The remainder of this chapter focuses on managing demand risk and cost risk.

8.2 Managing demand risks: control mechanism

Under a FLCB using the BBM, an ARR would be calculated for each year of the control period. As discussed in section 3, a control mechanism determines how the road service provider can recover its ARR from road users through its prices. It is not part of the BBM but is required under economic regulation (but not under price regulation) to translate the ARR into HV prices, and therefore HV charges, during the regulatory period.

The two most common types of control mechanisms are revenue caps and price caps. A hybrid of the two options is also possible. These mechanisms allocate demand risk differently between the road service provider and HV users. This section describes these option, sets out their advantages and disadvantages and presents our assessment. Our recommendation is provided in section 8.2.6.

8.2.1 Revenue cap

A revenue cap sets the maximum allowable revenue that a road service provider can recover from road users for each year of the regulatory period. To comply with this revenue constraint, a road service provider would forecast the demand for its services for the next year and set charges so that its expected revenue equals the revenue cap. The road service provider is likely to recover more, or less, than the allowed annual revenue due to demand forecasting error. The maximum allowable revenue in future years can be adjusted for the difference between the ARR and actual revenue of previous years using a correction factor.

A revenue cap therefore gives no incentives to the road service provider to grow (or constrain) demand for its services. Revenue caps are commonly applied and are universally applied in the Australian electricity network sector.



8.2.2 Price cap

A price cap sets the maximum prices or annual movement in prices that a road service provider can charge road users for each year of the control period. A price cap can apply either to individual prices or to a weighted basket of prices (i.e. a weighted average price cap, or WAPC). Under a WAPC, prices are rebalanced (i.e. some prices increased and others reduced) so long as the average change, weighted by the quantity of the service sold, does not exceed the WAPC formula (set out in Box 12).

As with a revenue cap, a road service provider would forecast the demand for its services for the next year and its price cap (or WAPC) to recover its ARR. However, unlike a revenue cap, if the actual demand for a road service provider's services deviates from forecast demand then its revenue increases above the ARR if demand is higher and its revenue decreases below the ARR if demand is lower. The road service provider therefore bears the demand risk and so has an incentive to grow demand for its services.

A WAPC has been widely used in the energy network sector but is now less common, particular because the Australian Energy Regulator has not wanted to incentivise electricity network service providers to grow demand for either maximum (peak) demand or energy consumption.

Box 12 - Weighted average price cap

A road service provider can adjust HV charges to increase HV revenues provided it does not violate the following formula:

$$\frac{\sum_{i=1}^{m} \sum_{j=1}^{n} (p_t^{ij} \cdot q_{t-2}^{ij})}{\sum_{i=1}^{m} \sum_{j=1}^{n} (p_{t-1}^{ij} \cdot q_{t-2}^{ij})} \le (1 + \Delta CPI)(1 + X_t)$$

where:

 p_t = the proposed prices for the upcoming year

pt.₁ = prices for the current year

 qt_2 = volume quantities for the most recently completed year

 X_t = the allowed real average price increase

 Δ CPI = the most recent change in CPI

And the double summation signifies that the WAPC formula is calculated across both tariffs and tariff classes.

The revenue recovered under a WAPC is influenced by the estimate of the demand increase made at the time of a revenue determination. If demand turns out to be more (less) than expected, the network business will receive more (less) than the target revenue.

The WAPC does not include a true-up mechanism, provided the road service provider complies with the WAPC formula.



8.2.3 Advantages and disadvantages

Revenue cap

A revenue cap protects road service providers from demand risk and shifts it to road users. In other words, while it guarantees the road service provider a level of revenue, road users' HV charges will increase if demand is lower than forecast (and their charges will decrease if demand exceeds the forecast).

There is less scope under a revenue cap than under a WAPC for a road service provider to benefit from adjusting its prices. Two situations where theoretically a road service provider and road users could benefit from setting more efficient prices are:

- if there are alternative road routes that create different costs for the road service provider, then the road service provider could rebalance its HV charges to signal to users the benefits of the lower cost route, and retain the cost savings; and
- under congestion pricing, a road service provider could reduce or defer its costs of augmentation by rebalancing its HV charges – increasing them in congested areas; and reducing them elsewhere.⁴⁷

Price cap (especially WAPC)

A WAPC would expose a road service provider to, but would protect road users from, demand risk. Economic theory⁴⁸ shows that a WAPC provides a greater incentive than a revenue cap for a road service provider to set allocatively efficient HV charges. In addition to the opportunities above:

- A road service provider could rebalance HV charges to increase the revenue that it recovers. It could increase the HV charges on road users with inelastic demand, while decreasing HV charges on road users with elastic demand. For an uncongested road, this would be allocatively efficient if heavy vehicles with elastic demand responded to the change and this promoted greater utilisation of the road assets.
- The road service provider can rebalance the HV components of the charge. For instance, the road service provider could increase the components of a Mass Distance Location (MDL) charge which is relatively demand inelastic; and decrease the components of the MDL which are more demand elastic.
- As above, if congestion pricing is introduced a road service provider can set prices higher in congested areas to avoid the cost of augmentation, thereby trading-off the

⁴⁷ However in practice, electricity network businesses operating under a revenue cap have historically tended to use relatively passive pricing strategies.

⁴⁸ See A Regulatory Adjustment Process for Optimal Pricing by Multiproduct Monopoly Firms Ingo Vogelsang and Jörg Finsinger, Bell Journal of Economics, 10(1), Spring 1979, 157-171



lower costs of operating the network against the lower revenue it receives because of reducing demand.

Setting tariffs in these ways (so-called Ramsey Pricing) is in theory an efficient way of recovering road costs.

There are three concerns that any future economic regulator of HV services may have with a WAPC, based on experience in other industries:

- The potential for a profit-focused road service provider to 'game' the original demand forecasts by understating them. Reviewing demand forecasts are a significant focus for the regulator under a WAPC.
- The potential for the road service provider to make 'windfall gains' by increasing HV charges (above the general increase specified in the WAPC) of components of particular services experiencing demand growth above its forecast.
- The incentive for a profit focused road service provider to want to continuously grow demand, and therefore their road network, in a manner not otherwise consistent with governments' broader policy objectives.

In energy network regulation, there has been considerable debate about whether under WAPCs there has been evidence in practice of more efficient pricing being applied. The Australian Energy Regulator considers that the theoretical incentives for efficient pricing have not been observed in practice. The Productivity Commission, however, questioned whether this may have been due in part to the lack (as at 2013) of smart meters⁴⁹, which in theory would create opportunity for more efficient tariff structures.⁵⁰

8.2.4 Side constraints

It is common for governments or economic regulators to create additional limits (i.e. over and above the control mechanism) on the increase in individual prices from one year to the next by setting a 'side constraint'. For example, an individual price may be limited from increasing by more than to CPI+2% per annum.⁵¹

Any decision to impose side constraints reflects a concern about managing a transition to cost reflective prices, limiting price shock for users and reducing uncertainty for those users who might otherwise be affected.

8.2.5 Analysis

As can be seen from the above discussion, there would need to be significant analysis, modelling and experimentation for road service providers, the regulator and others to

⁴⁹ Smart electricity meters are analogous to on-board telematics.

⁵⁰ Section 12 Electricity Network Regulation Inquiry Report. Productivity Commission, 26 June 2013.

⁵¹ See clause 6.18.6 of the National Electricity Rules that applies to electricity distribution network service providers.



understand fully the issues and opportunities arising from alternative control mechanisms.

We understand that implementing MDL pricing is a significant and challenging reform and that developing more efficient HV charging would not be a priority at this stage. We expect that it would be some time before there was enough experience and data for road service providers to be in a positon to design more efficient HV charges.

High quality data and demand forecasting is a key enabler for developing more efficient pricing. An issue for road service providers to consider is the opportunity to ensure the specification of vehicle telematics and information systems needed to implement MDL will have the full capability to capture the necessary data.

Finally, we note that the control mechanism is easily changed at each control period and so the decision made on the form of control for a prototype HV revenue model does not close off options for changing the control mechanism in future.

8.2.6 Recommendations for managing demand risks

A control mechanism is only relevant under economic regulation. A true-up mechanism of the kind discussed in section 8.3 could deal with both revenue and cost risks under price regulation.

We do not have sufficient information at this time to have a strong view about which control mechanism should be adopted if economic regulation is to be applied. Both a revenue cap and price cap (such as a WAPC) have advantages and disadvantages.

On balance, we recommend adopting a revenue cap because it is administratively simpler; it removes concerns about the potential for understated demand forecasts; and is a widely-used control mechanism in economic regulation.

If economic regulation applies, we recommend:

- 1. noting that both revenue cap and WAPC control mechanisms have advantages and disadvantages;
- 2. adopting a revenue cap as the control mechanism for the prototype HV revenue model;
- 3. noting that the decision on the control mechanism can be made late in the implementation process;
- 4. noting that the control mechanism can be readily changed if required between control periods it should be kept under review as the reforms develop;
- 5. if there is concern with users being exposed to significant increases in HV charges, then side constraints can be introduced. These would limit the increase in individual HV charges from one year to the next; and
- 6. road service providers should consider opportunities to ensure that the specification of vehicle telematics and information systems required to implement



MDL pricing will capture the data that will enable identification of more efficient HV charging options.

8.3 Managing cost risks

Cost risk arises because the revenue allowance in the BBM is set 'ex ante' (based on forecast expenditure) but actual (outturn) costs may not necessarily equal actual costs for a variety of reasons. This section:

- discusses the principles and practices for allocating cost risks applied in other regulated industries;
- drawing on this experience, recommends proposed 'foundation' principles for allocating cost risks where HV services are treated as an economic service;
- discusses issues concerning whether all cost risks should be allocated to users by way of a 'true-up' mechanism; and
- recommends the principles and practices for allocating cost risks and whether a true-up mechanism should be included in the BBM.

8.3.1 Principles and practices for allocating cost risks in regulated industries

This section sets out a high-level discussion of the principles and practices for risk allocation for regulated business in sectors such as water and energy.

The principles for allocating costs risks for regulated business are:

- 1. The business is expected to insure cost risks (either through external or selfinsurance⁵²) where it is efficient and feasible to do so. The BBM includes the forecast cost of insurance in the forecast opex allowance and recovers any relevant cost variances from insurance.
- 2. The business is entitled to recover aggregated positive cost variances that are prudent and efficient (not subject to insurance) subject to the cost variances being unforeseen and/or uncontrollable, exceeding materiality thresholds and meeting various other conditions.
- 3. The business is not entitled to recover:
 - a) costs that are already compensated in the BBM allowance⁵³;
 - b) costs not required to provide the services;

⁵² We understand that some road agencies do not currently insure any of its roads against events such as major weather events.

⁵³ For example, if a business forecasts a self-insurance allowance and the self-insured event occurs, it cannot then seek to recover the cost of that event from its customer base.



- c) individual instances of positive cost variances offset by negative cost variances;
- d) inefficient or imprudently incurred costs; and
- e) cost risks that are less than materiality thresholds.

The rationale for these principles is as follows.

Well-managed regulated businesses should establish insurance arrangements (external and/or self-insurance) where it is efficient and feasible to do so to insure against material unexpected costs. Insurance costs will be included as opex, and any costs arising from an insured event should in the first instance be met from insurance arrangements.

Regulated businesses have balance sheets with equity capital that provide them with some capacity to bear cost and revenue risk within a control period. It is reasonable to assume that normal variations between forecast and actual costs and revenues will balance out over time and not be an asymmetric risk. It is considered administratively inefficient to allow for revenue adjustments to deal with 'normal' cost and revenue variations, below a defined materiality threshold.

Broadly speaking, cost variations that are material (above a materiality threshold), not recoverable through insurance and are defined as being 'prudent and efficient', can be recovered (or passed back) to users. Typically, these mechanisms are symmetrical such that certain costs that are materially lower than forecast arising from a specific event are also passed back to users.

Regulators and rule makers take different approaches to setting materiality thresholds. For example, IPART recently determined that for Sydney Water, pass through events should only be introduced in exceptional circumstances.⁵⁴

Given that the revenues and charges are typically set in advance for a control period, significant cash flow financing issues will arise where there is a material increase in uncertain costs. This gives rise to the need for 'within control period' adjustment mechanisms. There are typically two mechanisms for making revenue adjustments to deal with material cost variations that are prudent and efficient:

- 1. a cost pass through mechanism; and
- 2. a contingent project mechanism.

Each mechanism allows the entity to recover its financing costs for the period until the amount can be recovered.

Typically, the regulatory framework and/or the regulatory decision will specifically identify the types of events that are eligible for pass through to customers, the materiality thresholds and other conditions. Where an event is not specifically

⁵⁴ Section 3.5.1, IPART, Review of prices for Sydney Water Corporation, 1 July 2016 to 30 June 2020.



identified, it cannot be passed through. Conditions typically apply to pass through approvals, including what supporting information must be provided to the regulator.

Table 7 provides further detail about costs risk allocation practices for regulated businesses in Australia.

Type of risks	Description	Example	Principle for risk allocation	Mechanisms
Cost variation	Certain events that create higher (or lower) costs than assumed at the time expenditure forecasts are finalised, and are either not efficient to fully insure (either through external or self- insurance) or exceed insurance caps.	 Electricity distribution rules⁵⁵ define the following default pass through events: a regulatory change event; a service standard event; a tax change event; and a retailer insolvency event. And they allow for the regulator to specify other nominated pass through events in its decision. Sydney Water had a pass-through event specified for the cost of operating Sydney Desalination Plant. 	Users should pay provided cost variation is material, and prudent and efficient. Immaterial and imprudent/ inefficient cost variation is borne by the business.	Cost pass through (of costs above the insurance/self-insurance amount). Potential cost pass through events specifically set out – if not listed, then any excess costs are met by the regulated business. Subject to materiality thresholds.
Uncertain project	Uncertainty regarding a material major project: such as its timing, design, cost etc.	Transmission augmentation driven by events outside of the control of the regulated business.	Users should pay provided costs are prudent and efficient. Projects are very material as a share of the total expenditure of the business, so cannot simply be accounted for at the next RAB roll-forward without jeopardising the financial viability of the regulated business within the regulatory period.	Contingent project mechanism - applies where at the time expenditure forecasts are made (or approved) there is uncertainty about the timing or cost of a project. When the project is ready to proceed, the regulator reviews it for prudency and efficiency and then approves the cost to be included in the cost base. Subject to materiality threshold.

Table 7 - Cost risk allocation practices for regulated businesses in Australia.

⁵⁵ Section 6.6.1 Chapter 6A National Electricity rules



8.3.2 Cost risk allocation for road service providers

As already noted, unlike regulated government businesses (such as water and electricity business), road service providers are currently not corporatised businesses and have limited ability to bear financial risk. They therefore cannot bear cost risk and, over time, their outturn (actual) revenue would need to equal their outturn (actual) expenditure. This means that approaches to managing the residual cost risks will need to be considered. This is considered in the next section.

If road service providers are established as statutory authorities or GOCs in future then they should have sufficient financial capacity to bear cost risks. Indeed, the nature of the cost, revenue and inefficiency expenditure risks they face should be an explicit factor in determining road service providers' financial structure.

We consider that the same principles for allocating cost risks under economic regulation that apply to other regulated business can apply to road service providers, at least as a starting point. These principles are set out in the recommendation below.

A detailed study would be required to develop an appropriate mix of arrangements for road service providers, such as for cost pass through events and contingent projects: the nature of the defined events or projects; principles for setting materiality; and procedures for a regulator assessing a road service provider's proposals.

8.3.3 True-up mechanism

We have been asked to advise whether the BBM should include a true-up mechanism, the implications for incentives and risk allocation and whether these issues should be addressed at this stage or in the next stage of work on the FLCB.

The context for considering the need for a true up mechanism depends in practice on any reforms to the national charging arrangements, which are out of scope for this report. As noted earlier, we have assumed that under price regulation, the notional revenue forecast produced by the BBM used to determine HV charges is also used to set a road service provider's forecast revenue for the provision of HV services.

IN this context, the purpose of a true-up mechanism is to ensure the outturn (actual) revenue for a road service provider is equal to outturn (actual) expenditure. We note that this is only relevant to a road service provider structured as a government department (scenarios 1 and 2) and would not be required by a statutory authority or GOC (scenario 3) that has a financial capacity for outturn (actual) revenue and expenditure to differ.

What risks would a true-up mechanism address?

The first question to consider is, what risks a true-up mechanism would address if it was included in the BBM?



This will depend on the range of other risk allocation arrangements (if any) that are already provided for. If the approach to risk allocation recommended above were adopted then the following risks will be already allocated:

- **Demand risk** | Under Scenario 2, we recommend adopting a revenue cap for the prototype HV revenue model. A revenue cap protects road service providers from demand risk and shifts it to road users. In this case, a true-up mechanism would not need to address demand risk.
- **Insurance** | As discussed above, we expect that road service providers should take out insurance (external and self-insurance) for cost risks where it is efficient and feasible to do so. Any insured events that give rise to additional costs should be met from insurance arrangements.
- **Financing risks** | As discussed in section 5, all financing risks would be included in the cost of capital.

The residual risks a road service provider could be exposed to, and which could be the target of true-up mechanism, would therefore be:

- additional (uninsured) opex and capex; and
- contingent project costs project costs being incurred that are material and uncertain when the expenditure forecasts were prepared.

Incentive and risk allocating effects of a true-up mechanism

This section analyses the incentive and risk allocation effects of a true-up mechanism. We first consider the situation where a road service provider is organised as a government department, and then where it is organised as a statutory authority or GOC.

Road service provider organised as government department

We understand a road service provider organised as a government department will have financial arrangements that account for financial surpluses and deficits. We have not studied state government financial management policies and processes in detail but we understand that a road service provider will face limitations that prevent it from going into significant financial deficit.

Table 8 details the options for managing residual cost risks, including who would fund the risks.

Table 8 - Options fo	r managing re	sidual cost risks
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	Option for managing cost risk	Party who funds cost
1.	Establish a true-up mechanism so that either:a) all residual cost risks can be passed through (either within a regulatory period or at the next price reset for the next regulatory period); or	Governments or road users



	Option for managing cost risk	Party who funds cost
	b) residual cost risks above some materiality threshold can be passed through.	
2.	Set materiality thresholds for cost pass through events very low, or at zero.	Road users
3.	Set materiality thresholds for contingent project events very low, or at zero.	Road users
4.	Meet residual cost risks from internal financial reserves (as noted, these are likely to be limited).	Road service provider
5.	Make available contingent state government funding from consolidated revenues to manage some, or all, of the shortfalls between actual revenues and actual expenditure. This amount could potentially be subject to a cap.	Governments
6.	Require the road service provider to bear the increased costs but meet a requirement to avoid going into deficit by making offsetting savings elsewhere, e.g. by reducing non-essential expenditure or deferral of lower priority expenditure. This may reduce the ability to meet target service levels.	Road service provider

It is possible that the best solution would be a combination of some, or all, of these options.

If the state government was to provide funding to cover additional costs this would provide an incentive for it and the road service provider to manage the risks giving rise to additional costs. On the other hand, it could also create incentives for the road service provider to reduce expenditure which may result in the road service provider not providing the service levels expected by users. This would not be consistent with the HV road reform objectives.

If the state government was not to provide funding to cover additional costs then the road service provider would have to reduce expenditure elsewhere to avoid going into deficit, which again may result in the road service provider not providing the service levels expected by users.

If a true-up mechanism was implemented (so that outturn revenue is equal to outturn expenditure) then this would have the following incentive and risk allocation effects:

- there may be a greater likelihood that service levels expected by users would be met but cost risks would be passed to users (unless they are not paid for by government); and
- the road service provider would have weak incentives to:
 - manage costs; or
 - forecast expenditures for future control periods accurately.

These outcomes would not be consistent with the HV road reform objectives.

Assessment

This analysis highlights that there are significant weaknesses in the departmental organisation model. In effect, cost risks are allocated between government and users, with the road service provider facing weak incentives for managing risk.

As discussed above, there are a range of options for how the residual cost risks could be allocated and a detailed study would be required to determine the most appropriate combination. In particular, this study would need to:

- assess the likelihood and consequence of the residual cost risks through scenario analysis;
- consider government financial management policies governing government agencies;
- consider the government's budget allocation process; and
- consider the extent to which it is acceptable for target service levels not to be met and the time horizon over which expenditure and investment deferral decisions would affect service levels.

Road service provider organised as statutory corporation or Government owned corporation

If road service providers were to be established as statutory authorities or GOCs, they should have balance sheets that are explicitly designed to allow them to enter financial deficit, in order to manage cost risks without compromising service outcomes and enable them to make offsetting profits at times of positive performance. In principle, it should not be necessary to have a true-up mechanism.

8.3.4 Recommendations for managing cost risks

We recommend:

- 1. Managing both cost and demand risk through a short control period of one to two years. This should lessen the need for other mechanisms, and should make the size of any true-ups smaller because the window of forecasting error is shorter.
- 2. Adopting the following foundation (long term) principles for the allocation of cost risks (actual costs being higher in aggregate than forecast costs):
 - a. A road service provider should be expected to insure cost risks (either through external or self-insurance) where it is efficient and feasible to do so; include the forecast cost of insurance in the forecast Opex allowance; and recover any relevant costs from insurance.
 - b. A road service provider should be entitled to recover prudent and efficient costs (not subject to insurance) related to the provision of services including:
 - The amount by which aggregate actual costs in a control period exceed forecast costs; but
 - Subject to the relevant cost variances exceeding materiality thresholds and meeting various other conditions.
 - c. Materiality thresholds and other conditions should strike a balance between minimising administrative costs and enabling the road service provider to financially manage risk.



- d. A road service provider should not be entitled to recover from users:
 - costs not required to provide HV services;
 - inefficient or imprudently incurred costs; and
 - cost risks that are less than defined materiality thresholds or do not meet the required conditions.
- 3. A study could be undertaken as part of the second stage of work on the FLCB to develop these principles in more detail.
- 4. A true-up mechanism (which would ensure the outturn revenue for a road service provider is equal to (or close to) outturn expenditure) should only apply to road service providers organised as a government department. However, it should be noted that:
 - a. a true-up is only one of a range of options for managing residual cost risks (not allocated in line with the above principles);
 - b. a detailed study would be required to determine the most appropriate combination of options.
 - c. a control mechanism could be applied with a true-up mechanism if a road service provider organised as a government department was subject to economic regulation. This would mean that the revenue risk would be dealt with through the control mechanism and the true-up mechanism would deal with any differences between revenue and expenditure.
 - d. a study could be undertaken in the second stage of work on the FLCB of the options for managing residual cost risks, including the option for true-up mechanism. Both cost pass through and contingent projects would likely have little, if any, benefit under either price or economic regulation for as long as a road service provider is a government department.
 - e. if road service provider is established as a statutory authority or GOC, it should have a balance sheet that is explicitly designed to allow it to enter into financial deficit, in order to manage cost risks without compromising service outcomes and enable them to make offsetting profits at times of positive performance. In principle, it should not be necessary to include a true-up mechanism in the BBM.

9. Role for incentive regulation mechanisms

This section provides advice on incentive regulation mechanisms. It sets out relevant experience with incentive based regulation in other sectors. It also analyses how decisions about the level of service should be treated in the initial BBM and; how the treatment of level of service might evolve in future.

The discussion of incentives is most relevant to Scenario 3 (i.e. economic regulation of government corporation). As discussed earlier, we consider that meaningful financial incentives can only be created when a road service provider has a balance sheet and sufficient independence from government. We note, however, that there may be preparatory work to develop incentive regulation mechanisms undertaken at an earlier stage of reform.

Section 9.1 discusses the experience of incentive regulation in other sectors. Section 9.2 sets out our assessment of the potential for applying incentive regulation mechanism to road service providers and suggest the approach governments should take to whether, and how, to apply incentive regulation mechanisms. Section 9.3 discusses the setting of service levels.

9.1 Experience with incentive regulation in other sectors

Incentive regulation in its broadest sense, means:

the use of rewards and penalties to induce the utility to achieve desired goals where the utility is afforded some discretion in achieving goals. ⁵⁶

Typically, in Australia, the specific goal of incentive regulation is to promote cost minimisation:

Where the regulatory rewards to the business are (at least significantly) separated from their actual costs, profit-motivated businesses face strong incentives to cost minimise in any given period. Over time, the regulator can rein in the rents this creates by raising the performance benchmark. ⁵⁷

Box 13 discusses the historical development of incentive regulation internationally and Australia. Box 14 summarises the typical features of how incentive regulation applies for regulated energy business and some water businesses in Australia. There is some debate

⁵⁶ Introduction to the fundamentals of incentive regulation, Sanford V. Berg, Public Utility Research Center, University of Florida <u>http://regulationbodyofknowledge.org/wp-content/uploads/2013/03/Berg_Introduction_to_the.pdf</u>

⁵⁷ Productivity Commission, Section 7.2 Electricity Network Regulation Inquiry report. 26 June 2013.



as to whether state-owned road utilities do in fact respond effectively to financial incentives. This is discussed in Box 15.

Box 13 - The development of incentive regulation

'Cost of service regulation' developed in the United States in the 1930's as a method for setting prices for monopoly services. It involves regular reviews (called 'rate cases') where privately owned regulated business apply to an independent regulator for approval to adjust prices to reflect changes in its costs, so that it could achieve a rate of return that would encourage it to continue to invest. The regulator would review the application to determine whether costs, particularly any new or increasing cost were prudent and efficient.

In a famous 1962 paper, Averch and Johnson⁵⁸ showed that, if the regulator sets the regulatory rate of return above the firm's true cost of capital, the regulated firm has an incentive to behave inefficiently and to choose too much capital relative to labour – this is often called 'gold plating'.

This observation sparked significant empirical and theoretical literature exploring the 'Averch–Johnson' effect, and this evolved into interest in developing alternative regulator mechanisms that encouraging regulated business to minimse their costs.

Box 14 - Features of utility incentive regulation in Australia

- Utility managers have a relatively high degree of discretion as to how they manage their businesses.
- Incentive regulation applies to for-profit businesses and it is assumed that the businesses are motivated to increase their efficiency in a way that will increase profitability (or avoid its profits being reduced if it is relatively inefficient).
- The regulator approves forecast revenues that are based on a 'benchmark efficient firm' and, using a BBM, converts annual revenues into 'smoothed' annual revenues typically over (say) five years.
- Because revenue and price are set in advance for (say) five years, the business has an opportunity to reduce its costs below those assumed by the regulator to increase its profits (and it is penalised if its costs inefficiently increase during the control period).
- At the end of the five-year control period, the regulator can use the information that has been generated on the business' cost base ('revealed efficiency') to set forecast revenues for the next control period. The regulator seeks to strike a balance between ensuring the business has ongoing incentives for finding

⁵⁸ Behaviour of the Firm under Regulatory Constraint, Harvey Averch and Leland L. Johnson, American Economic Review, 52(5), December 1962, 1062-106973.



further efficiencies and sharing efficiency benefits between investors and customers.

- Introducing incentives to reduce costs creates other risks, such as the risk that costs could be reduced inefficiently, for example causing a reduction in service quality, or a lack of investment to meet an unexpected increase in demand.
- Therefore, other incentive schemes may need to be introduced to counterbalance the incentive to reduce costs inefficiently. In particular, service incentive schemes are often introduced to penalise (and reward) the business for reducing (or improving) service performance.
- Regulators may also introduce incentives to:
 - provide continuous incentives to incur capital and operating expenditure evenly through the control period (rather than front or back-ending expenditure);
 - discourage businesses from favouring capital expenditure over operating expenditure, or vice versa;
 - discourage a business from spending inefficient capital expenditure to inflate its regulatory asset base;
 - encourage a business to pursue capex efficiencies by using actual rather than forecast depreciation to roll forward the RAB;
 - encourage businesses to invest in innovations that can benefit users by promoting dynamic efficiency; and
 - minimise adverse outcomes over which a business has some control ⁵⁹
- Regulators may also establish schemes (typically called a Guaranteed Service Level scheme) under which users receive payments from the service provider if the levels of service that they receive fall below defined minimum standards.
- More recently, Australian regulators have been exploring different types of incentive mechanisms to achieve other goals that they deem important. For example, the Victorian Essential Service Commission is introducing incentives for water businesses to improve how they consult with customers and is encouraging more innovation in developing expenditure plans.

 $^{^{59}}$ Eg or the number of bushfires in an electricity network business' service area.



Box 15 – Would government-owned road service providers necessarily respond effectively to financial incentives?

The Productivity Commission has argued that in electricity network regulation the investment incentives for state-owned corporations are more complex than for privately-owned businesses, and can work against the cost minimising incentives in the regulatory regime. This reflects several factors:

- Finance appears to be easier to access for state-owned corporations than private businesses (certainly in recent times). The consequence is that, in comparison with private businesses, the weighted average cost of capital (WACC) actually facing state-owned corporations is likely to be lower than the regulated WACC;
- Financial market accountability is concentrated in just one party (the government). In contrast, private businesses must typically secure their equity or debt from multiple parties, all of which monitor the performance and potential risks of the business when deciding whether to provide finance;
- Insolvency of state-owned corporations is effectively impossible;
- Governments have non-commercial incentives that constrain state-owned corporations' behaviour; and
- Governance arrangements may not encourage tough-minded management. ⁶⁰

In support of this view, Professor George Yarrow et al stated:

The NER [National Electricity Rules] and NGR [National Gas Rules] are based upon an economic approach developed for the regulation of privately owned utilities. Whilst the approach can, and has, been applied to state owned entities international experience tends to indicate that it is more difficult to get to work effectively. Underlying issues include a relative lack of incentives to reduce costs in publicly owned monopolies, and intra-government conflicts relating to the supervision of publicly owned monopolies (most typically between that part of government responsible for performing shareholder functions and the regulatory authorities).⁶¹

⁶⁰ Section 7.2 Electricity Network Regulation Inquiry report. Productive Commission, 26 June 2013.

⁶¹ Yarrow, G., Egan, M. and Tamblyn, J. 2012 *Review of the Limited Merits Review Regime, Interim Stage Two Report,* 31 August

9.2 Assessment of the potential for applying incentive regulation mechanism to road service providers

It may be worth exploring in future whether incentive regulation mechanisms could be applied to 'business like' road service providers (Scenario 3).

However, we consider government would need to consider carefully whether it is realistic for the benefits of incentive regulation to be achieved given the limitations of state ownership and the specific details of the governance and model adopted.

We suggest that the first priority in reforming road service providers should be to improve their transparency and governance. It is likely that this would produce significant gains.

Before considering introducing profit-based incentive regulation to corporatised road service providers there would need to be confidence that:

- their future profitability can be influenced by genuine changes in their efficiency; and
- management performance within road service providers would be influenced by profit-based incentive.

If it was determined that applying incentive regulation was likely to bring about gains we consider that it is important for jurisdictions to think about incentives broadly and from first-principles (i.e. rather than simply adopting the incentive schemes that apply in other regulated industries, such as energy or water).

The first-principle questions could include:

- What are the desired goals for improving HV service provision?
- What changes in behavior of road service provider managers should be encouraged?
- What are the priority areas for change and what changes would add the most value?
- In what areas do managers in road service providers have sufficient discretion and independence from government?
- What types of rewards or penalties (if any) would meaningfully affect the behavior of managers of road service providers?

Answering these questions is likely to benefit from extensive engagement with road users, as they will have a keen view about where improvements are most required.

If this analysis suggested there was a role for specific types of incentives, then a further set of questions would arise, such as:

- Is the target of an incentive able to be meaningful defined and measured?
- Are there risks in over-emphasising achieving particular goals at the expense of other desired goals, for example cost compared with service quality?
- Are there risks of an incentive having unintended side effects?



- - What would be the appropriate strength of the incentives?
 - What are users willing to pay for incentives?

One specific opportunity raised in feedback is that road maintenance is a significant factor in the cost of HV services. Therefore, a matter that could be given priority consideration is whether there may be a bias under a simple BBM approach to inefficiently favoring capital expenditure (which is able to earn a rate of return) over operating expenditure (which does not), and if so whether this is a priority area for assessing improved incentives. This is the purpose of the 'Totex' approach, which is discussed further in Appendix D.

9.3 Setting service levels

HV road reform aims to provide clear links between the needs of users, the charges they pay and the services they receive. Under economic regulation it is proposed the independent regulator would set agreed service levels. The agreed service levels are an important input into expenditure plans, which in turn affect the level of HV required revenues and HV charges. Box 16 sets out possible principles and requirements for the service level definition and associated processes.

Box 16 - Principles and requirements for service standard definition and associated processes⁶²

Service standards must be meaningful to the HV road user's economic decisions The service standards (and associated pricing) must signal useful information which promote HV road service providers to make more efficient decisions (capex and opex, operating decisions) that are economically optimal for the total system. This principle probably involves the greatest change from current practice.

Service standards must be meaningful to road planning, investment and provision **process** | Service standards should capture the most material relationships between the service levels and the cost of road provision.

Service standards must be capable of measurement | service standards must be able to be measured directly or estimated on a reasonable basis.

Service standards should be set independent of any policy constraints on pricing The reform options vary significantly in regard to the constraints on the types of costs that are to be included and the type of price structures that can set. However,

⁶² Farrier Swier Consulting, Note 1 - Heavy vehicle road service standards, Economic regulatory input to HVCI reform project, Collated Working Papers (January to March 2013). October 2013 https://www.ntc.gov.au/Media/Reports/(F8D09C35-D651-453F-BA17-A08CA21CC994).pdf





service standards should be set with reference to users' requirements, and should not be constrained by current policies on pricing.

The number of service standards must balance benefits of complexity with simplicity | Typically in other utility industries, a small number of service standard types will capture the majority of users' and planners' requirements. Thereafter, adding service standards will result in diminishing benefits and increased cost and complexity.

The process for developing service standards must promote the credibility of the HV reforms to users. |To the extent the road users are consulted and support the service standards the more they are likely to understand and support the overall reform. The process of setting service standards needs to involve effective engagement with users and is not simply a technical exercise.

An important next step is to determine how to encourage the road service provider to achieve the defined service levels. The minimum requirement would be to establish a system of performance monitoring and reporting. This could potentially be strengthened by establishing a service quality incentive scheme, as discussed in Box 16 above.

In regard to user consultation on setting levels of service, experience in energy and water has been that customer participation will be most effective if it is adequately resourced, professional and evidenced-based. There are already significant road user companies and user representative bodies involved in HV user participation in Australia. However, it is noteworthy that the UK government recently decided to establish a government sponsored body, Transport Focus, as a representative body for users of England's Strategic Road Network. ⁶³

⁶³ Transport Focus is an independent, consumer-focused body that represents transport users and, including from 2015, users of England's Strategic Road Network (SRN) which is managed by Highways England. Its role is to represent the interest of consumers and "be useful to those in government and the transport industry who make major decisions about services and infrastructure. (It) uses evidence to drive change for the better." A key objective in Transport Focus's 2016-15 work plan is "to promote the voice of road users, trailing new research methods with a view to developing a satisfaction survey for the future".



10. Implementation of BBM

10.1 Introduction

This section sets out a detailed checklist of issues that we recommend be considered in developing and applying the BBM under the three scenarios discussed in section 4, although not all matters are relevant to each scenario. This section helps to provide an understanding of how the development and application of the BBM will work in practice. The listed issues need not be dealt with sequentially.

Important implementation questions include:

- the extent to which the treatment of these issues is defined by government as a policy matter (for example, in the law and subordinate instruments such as rules) and the extent to which they are left to the regulator's discretion (in consultation with the road service providers and stakeholders);
- whether there are benefits in national harmonisation versus road service providers proposing their own approaches; and
- striking an appropriate balance between road service providers incurring costs, (or having reasonable transition periods) to change their internal processes versus the benefits of more nationally harmonised arrangements.

None of these questions is considered further here.

10.2 Elements of the implementation issues

There are three elements to this checklist of issues

- Establish the framework |This involves setting the key parameters for determining the FLCB using the BBM and determining how they will be applied.
- Determine the ARR | This involves calculating each building block component within the BBM to establish the ARR over the control period and applying the control mechanism (under economic regulation only).
- **Recover the revenue** | This involves developing the HV prices to recover the ARR (modified for any revenue adjustments) in accordance with any control mechanism, and instituting related information collection and reporting arrangements.

Figure 10 illustrates the sub-components of these three elements, which are described further below by reference to earlier sections in this report.







Figure 10 - Issues to be addressed in developing and applying BBM

10.3 Establish the framework

It is necessary to develop the specific form of the BBM under any of the three scenarios by establishing the framework and key parameters for how it will be applied.

10.3.1 Issue 1 – Define services and confirm service standards

A road service provider's costs and charges will depend on the specific HV services that it provides to users. We have not reviewed the services to be provided. However, feedback suggested that in addition to the standard 'road access' service, road service providers provide other services such as licensing and registration.

We envisage that the BBM will be appropriate for assessing costs and determining allowed revenues for a large proportion of the HV services. However, if the costs of other services (for example licensing and registration services) are to be separately recovered from users, there might be better methods than the BBM for calculating the costs of these services.

HV services whose costs are not best determined by way of the BBM could be excluded from the BBM (and the costs not reflected in the associated ARR). For example:

• as discussed in section 6 it may be appropriate to use the renewals' annuity approach to calculate the costs of certain assets; and



• there may potentially be some services that are predominantly provided by way of operating inputs and which may lend themselves to a different method for calculating costs.

Finally, we note there may be some services which are deemed CSOs, and will be partially or fully subsidised by government. Decisions will be required about the treatment of these services and whether they are included in the BBM.

The first task is therefore to define the HV services to which the BBM will apply. In other industries, these are variously referred to as 'prescribed services', 'reference services', 'declared services', 'regulated services' or 'standard control services'.

We recommend assuming that all HV services are covered by the BBM for the prototype HV revenue model.

As discussed in section 9.3, there is a related need to confirm the service levels that the road service provider must meet in providing its services. We expect that determining these service standards will be a complex task, but it is fundamental to developing the 'price-service agreement' that underpins the BBM.

10.3.2 Issue 2 - Understand policy objectives / constraints

It will be important to determine the range of policy objectives or constraints that are relevant to determining a road service provider's ARR. These can potentially impact both the quantum of, and profile for, recovering the road service provider's ARR. These include, for example, any constraints on the future price path for HV charges, and whether there is a desire for private participation in future road service provision.

This report discusses a range of ways in which components of the BBM can be applied and adjusted to accommodate the approved policy objectives and constraints.

10.3.3 Issue 3 – Set control period

The control period is the period over which the control mechanism applies – it is therefore also the period for which ARRs are determined using the BBM.

Typically, the control period is agreed between a regulated entity and its regulator. We recommend that at a minimum this practice applies to HV services, as it is appropriate for the road service provider to provide input into this decision.

Another factor that may affect the length of the control period is the charging and revenue recovery arrangements. For example, if there is a centralised national revenue and charging mechanism then there may be benefits in (or a practical requirement for) a nationally consistent control period (at least initially).

We suggest that the likely feasible options for the length of the control period are between one and five years. Factors to consider in setting the control period are:



- Administrative burden There are significant fixed costs for regulated entities and the regulator in preparing and approving ARRs. This suggests a longer control period is preferable.
- Accuracy of expenditure forecasts Feedback from judications indicates that the accuracy of expenditure forecasts reduces significantly beyond a period of about two to three years.
- *Maturity of the regime* When a new regime is being introduced, there will inevitably be improvements that can be made to future periods. This suggest that the first control period should be shorter to allow improvements to flow through quickly.
- *Incentive properties* Efficiency incentives become stronger with the length of the control period. Other industries with mature incentive regulatory regimes typically have control periods of at least five years. As we recommend economic regulation not be applied initially to HV road services, this is not a relevant factor in the immediate term.

Indicatively, we recommend using a one to two-year control period for the prototype HV revenue model.

10.3.4 Issue 4 – Select control mechanism

This is discussed in section 8. On balance, we recommend adopting a revenue cap when economic regulation is introduced because it is administratively simple; it removes concerns about the potential for understated demand forecasts; and is a widely-used control mechanism. This should be implemented with a 'correction factor' (under/over-recovery mechanism) that allows the road service provider to adjust the revenue it can recover in future years for excesses or shortfalls in its revenues from year to year. This ensures that the road service provider is guaranteed to recover no less or more than its revenue caps over time.

The formula for the revenue cap control mechanism is:

$$\sum_{i=1}^{m} \sum_{j=1}^{n} (p_t^{ij} \cdot q_t^{ij}) \le AAR_t + X_t$$

where:

 p_t = the proposed prices for the upcoming year

qt = volume quantities for the upcoming year

 ARR_t = the allowed aggregate revenue for year determining in the BBM

 X_t = the adjustment for under or over recovery of revenue in the prior year(s).

We note that a control mechanism is not relevant under price regulation and should only be applied under economic regulation.



10.3.5 Issue 5 – Set incentive schemes (if any)

This is discussed in section 9. We recommend that road service providers engage closely with road users to understand the kinds of outcomes that they value, and for which they are prepared to pay.

As noted, we recommend initially not applying additional incentives to HV services, principally because the road service providers are not-for-profit entities. Rather, the focus should initially be on:

- improving transparency, governance and end user outcomes; and
- other types of public sector management incentive arrangements, where adopted by state governments, could encourage road service providers to achieve desired goals of the reform such as benchmarking performance.

10.3.6 Issue 6 - Confirm any other risk sharing mechanisms

Cost sharing mechanisms, such as cost pass-through and contingent project mechanisms, are discussed in section 8.2. These can apply within a control period. They are, however, indirectly relevant to setting the ARR, and the road service provider's expenditure forecasts may therefore change, depending on whether these mechanisms apply. For this reason, the cost risk sharing mechanisms should be settled before the ARR are determined.

As discussed in section 8.3.3, a true-up mechanism could apply if a road service provider is a government department to ensure the outturn revenue for a road service provider is equal to (or close to) its outturn expenditure.

As noted in section 8, we recommend that a study be undertaken in the second stage of work on the FLCB to examine the options for managing residual cost risks, including the option for a true-up mechanism. Both cost pass through and contingent projects would likely have little, if any, benefit under either price or economic regulation for as long as a road service provider is a government department.

10.3.7 Issue 7 – Establish cost allocation method

A road service provider will need to have a cost allocation method to:

- directly attribute costs to HV services;
- allocate shared costs (e.g. corporate overhead) between HV services and LV services; and
- allocate costs between different types of HV services (if the BBM, and a single control mechanism, are not applied to all HV services).

Each road service provider will need to have its own cost allocation method to accommodate its unique (and continually changing) circumstances, although they might

be prepared in accordance with a common set of cost allocation principles. This cost allocation method will be applied to both forecast and actual expenditure.

Related to this, there may also in time be a need for shared asset arrangements that adjust a road service provider's ARR if its assets are used to provide other services, so that road users are not funding other revenue streams (and the road service provider doesn't earn a return on it more than once)⁶⁴. We do not expect shared asset arrangements will be needed for the prototype HV revenue model.

10.3.8 Issue 8 – Establish capitalisation policy

Each road service provider will need to have a policy that defines its capex and opex and provides internal guidance for the appropriate accounting treatment of its costs, including having regard for relevant accounting standards. There may be a benefit in national harmonisation of capitalisation policies, depending on the objectives for the HV charging arrangements. This could be considered in the second stage of work on the FLCB.

Each service provider will need to have its own capitalisation policy to accommodate its unique circumstances. This policy will be applied to both forecast and actual expenditure. This issue can be ignored in developing the prototype model.

10.3.9 Issue 9 – Establish contributions policy

It may be appropriate to establish a capital contributions policy. Capital contributions are payments in cash or kind and should be excluded from the HV RAB, as it would be inappropriate to earn a return on, of capital where the road service provider has itself not made an investment.

Contributions could be made by a user or group of users to enable access to a nonstandard service – for example for Incremental Freight Pricing, or to have a service provider bring forward an investment it would have otherwise made later. Contributions might be made by a government, or other parties (such as other utilities, for rectification of a road, developers or large commercial users of remote roads such as mining or forestry industries).

10.3.10 Issue 10 - Confirm asset roll forward and revenue models

It is desirable to have universally accepted models for:

⁶⁴ An example of where a shared asset arrangement applies is where an electricity network provides services to telecommunication companies. It ensures that electricity customers benefit from some of the additional revenues, while providing incentives to the electricity network owner.


- rolling forward the road service provider's regulatory asset base from one control period to the next; and
- determining the ARR.

For example, in the electricity network sector, the Australian Energy Regulator has published roll-forward models and post-tax revenue models, together with associated explanatory handbooks. These are used by both the regulator and the regulated businesses.

We envisage that equivalent HV models will need to be developed for road service providers.

The RAB roll-forward model should address, for example:

- whether capex is incorporated into the RAB when it is incurred or when it is commissioned; and
- whether the RAB is rolled forward using actual depreciation or forecast depreciation.

Alternative responses to these kinds of matters will present different risks and incentives to road service providers.

We recommend that an initial illustrative version of these models be prepared as part of the second stage of work on the FLCB.

10.4 Determine the ARR

Once the framework has been established, the BBM can be used to determine the ARR and the control mechanism (if applicable).

10.4.1 Issue 11 – Establish initial regulatory asset base

This issue is discussed in section 6. We recommend that the 'base case' initial RAB value should primarily be based on the line-in-the-sand approach to be consistent with a specific price constraint and the cost of capital.

Under the line-in-the-sand approach it will not be necessary to undertake a valuation of the entire road network. The value of the HV RAB can be determined based on an economic valuation as described in section 6.

Road service providers will need to consider how to value the remaining asset base attributed to LV when or if there is reform of LV charging, however this has no immediate implication for economic regulation of HV services.

One issue that will need attention is the treatment of land. We understand that land purchases are included in the PAYGO cost base. We further understand that the value of land reserved by governments for future potential roads can be significant. We suggest that future policy work should be undertaken with regards to the treatment of

land, including as road service providers become more business-like (Scenario 3). This would include addressing the following questions:

- The appropriate party to own utilised and undeveloped land (government or the road service provider); whether this land should be included in the RAB; and if land is not included in the RAB, whether government could charge land rentals to road service providers to be recovered through Opex.
- Whether there are incentive objectives for managing the land portfolio reserved for future roads or reconfiguring existing roads which should be considered in developing incentive features of the regulatory framework.
- It may be feasible to ignore the treatment of land in developing the prototype model.

10.4.2 Issue 12 – Engage road users

As discussed in section 9.3, we expect effective engagement of road users by road service providers will become important to the future success of any HV economic regulatory framework.

We recommend that the future development of the FLCB model explicitly recognise the importance of engaging road users and that the framework actively build-in means of promoting it.

10.4.3 Issue 13 – Forecast demand

The prototype HV revenue model will require demand forecasts of HV services to inform road service providers' capex and opex forecasts. We understand road service providers already undertake demand forecasting for expenditure planning purposes.

Demand forecasts will also be required to apply the control mechanism and to prepare HV prices. Demand forecasts are not currently prepared for this purpose.

10.4.4 Issues 14 and 15 - Opex and Capex

As discussed in section 4, a road service provider's ARR could be forecast based on its assessment of:

- its actual opex and capex under price regulation; or
- prudent and efficient benchmark costs under economic regulation.

As discussed above, applying actual costs is the only feasible option when a road service provider does not have access to a means of managing the risk that its actual costs exceed an estimate of benchmark prudent and efficient costs. As discussed in section 8, the possible means for managing this risk for a road service provider organised as a government department include a true-up mechanism or access to additional government funding.



We recommend initially basing the opex and capex forecasts in the prototype HV revenue model on road service providers' forecast actual costs, given that they are not-for-profit entities. Road users could still be actively consulted in developing these forecasts and on what the road service providers spend within the period. The cost allocation methods and capitalisation policies discussed in Issues 7 and 8 above would be used to prepare both the forecast and outturn expenditure.

Under economic regulation, road service providers would be required to justify that their expenditure forecasts are prudent and efficient, having regard for defined objectives and criteria, and the regulator could assess the forecasts before they are reflected into the BBM for calculating the ARR. This is a complex process that can potentially require the road service provider and the regulator to utilise a wide variety of bottom-up and top-down justification and assessment techniques. Lessons learned from applying price regulation (scenario 1) will no doubt inform decisions on how to determine the prudency and efficiency of expenditure forecasts. Considering this process is beyond the scope of this report.

The standard approach in Australia is to forecast opex and capex separately, and we recommend adopting this approach for HV services. However, we note an emerging possible change in regulatory practice to the treatment of opex and capex – the Totex approach - see Appendix D.

10.4.5 Issue 16 – Forecast regulatory depreciation

This is discussed in section 7. The regulatory depreciation component of the BBM should:

- only recover the real value of the road service provider's assets over their economic lives at which they were first included in the regulatory asset base; and
- use a profile that reflects the nature of the assets over their economic lives.

We recommend that road service providers propose the economic lives of their assets and the associated depreciation methods and rates. We expect these will need to be the subject of detailed studies.

As discussed in section 7, we recommend using a real straight-line approach for determining regulatory depreciation in the prototype HV revenue model.

Depreciation is meant to reflect the payback of assets as they are consumed over their life and thereby also support funding for replacement investment. For this reason, it is common to exclude land assets in the RAB from depreciation as their value is not eroded through use or time. We recommend the prototype HV revenue model exclude land from depreciating asset classes. The appropriate treatment of land for depreciation purposes requires further investigation.

10.4.6 Issue 17 – Roll forward regulatory asset base

This is discussed in sections 3 and 6. The regulatory asset base will need to be rolledforward at the start of each regulatory control period and then for each regulatory year of the control period to calculate the ARR. This should be undertaken in the asset rollforward and revenue models discussed in Issue 10 above.

10.4.7 Issue 18 – Determine allowed rate of return

This is discussed in section 5.

We recommend that the return on capital under price regulation should be based on reasonable estimates of the actual costs of capital that apply to road service providers operating as a government department and reflect relevant government financial policies and practices.

If economic regulation is applied then we recommend that the return on capital is:

- set to reflect the efficient financing costs of a benchmark efficient entity; and
- based on the benchmark cost of capital using a pre-tax WACC for simplicity, but potentially moving to a post-tax WACC in future.

As discussed in section 5, important next steps in determining the cost of capital under economic regulation are to:

- develop guiding principles or objectives; and
- consider implementation issues such as how to define the benchmark and what estimation methods, financial models and data to use.

10.4.8 Issue 19 – Estimate corporate income tax allowance (if any)

This allowance is not an essential component of the BBM. It is typically estimated using the taxable income of an efficient benchmark entity, rather than the service provider's estimate of its likely tax liability.

We recommend not including the tax component in the prototype HV revenue model, given that the road service providers are currently not-for-profit businesses and do not pay tax.

If, in the future, road service providers are allowed to recover the cost of tax, then, as discussed in section 5, either a pre-tax, or a post-tax, WACC could be applied:

- A pre-tax WACC is grossed up to include an assumed cost of corporate income tax and there is no separate corporate income tax building block used to calculate the ARR.
- A post-tax WACC is used then the assumed cost of corporate income tax is included as a separate building block that is calculated using forecast taxable revenue and expenses, rather than in the return on capital allowance.



10.4.9 Issue 20 – Determine revenue adjustments (if any)

There are a range of revenue adjustments that could be applied to the ARR during a control period, including:

- true-up adjustments for either differences between outturn revenue and outturn expenditure;
- risk allocation adjustments, including any positive or negative cost pass through amounts and any amounts for approved contingent projects;
- correction factor adjustments under a revenue cap control for any shortfall or overrecovery of revenue in the preceding year, although this is only relevant under economic regulation;
- incentive scheme adjustments for any rewards and penalties under any incentive scheme, although we recommend that these are not applied in the immediate term.

We recommend in section 8 that a study be undertaken in the second stage of work on the FLCB of the options for managing residual cost risks, including the option for trueup mechanism. Both cost pass through and contingent projects would likely have little, if any, benefit under either price or economic regulation for as long as a road service provider is a government department.

10.4.10 Issue 21 – Determine ARR

This involves calculating the road service provider's ARR for each year of the control period using the revenue model discussed in Issue 10. This is a mechanistic outcome of the application of the BBM.

10.4.11 Issue 22 – Apply control mechanism

This issue is discussed in section 8.2. Under economic regulation scenarios, it involves applying the control mechanism determined in Issue 4, by applying the demand forecast in Issue 13 to the ARR calculated in Issue 21, modified for any revenue adjustments within the period from Issue 20.

If, as we recommend, a revenue cap is applied under economic regulation, then the prototype HV revenue model will result in revenue caps for each year in the control period.

10.5 Recover revenue

The approach to revenue recovery will differ depending on:

- the applicable scenario; and
- the charge setting and revenue collection arrangements which could either be national arrangements or the individual responsibility of each road service provider, probably operating within a national framework.



The charge setting and revenue collection arrangements are not considered in this report.

10.5.1 Issue 23 – Determine HV prices and charges

Once the ARRs have been established, and the control mechanism and revenue adjustments have been applied (under economic regulation), then the HV prices can be determined and applied to HV charges.

As noted above, determining the process for how HV charges are determined (individually by road service providers or through some national process); and the form and structure of these HV prices is beyond the scope of this report.

10.5.2 Issue 24 – Apply revenue adjustments (if any)

This involves adjusting the revenue cap (or other control mechanism) for the allowed revenue adjustments detailed in Issue 20 within and between control periods.

The amounts of these adjustments will not become evident until during, or at the end of, the control period.

10.5.3 Issue 25 - Collect and report information

Within the control period, the road service provider will need to collect and report revenue and expenditure information, consistent with its cost allocation method and capitalisation policy. This is required so that it can:

- demonstrate compliance with its control mechanism;
- apply any adjustment mechanisms during the control period; and
- roll forward its RAB at the start of the next control period.

II. Next steps to develop the prototype model

We expect that, at a minimum, jurisdictions will want to develop a prototype model in the second stage of work on the FLCB consistent with Scenario 1 (i.e. government department subject to price regulation). This section sets out our views on how to develop this prototype model.

We consider that it will be beneficial to develop and apply the prototype model to one or more road service providers using realistic information, rather than to undertake purely conceptual analysis and modelling. This will provide more meaningful and credible insights to senior decision makers, including Ministers. Therefore, for discussion, we propose the following steps to develop the prototype model and to specify the required analysis:

- 1. Define the objectives of the analysis for the second stage of work on the FLCB.
- 2. Define the role of the prototype model in meeting these objectives.
- 3. Agree the high-level design of the BBM, using the model set out in section 4.1.1 for Scenario 1 as a starting point (noting that this will likely evolve through the analysis in the second stage of work on the FLCB).
- 4. Depending on the objectives and role of the prototype model:
 - a) Determine design parameters, such as:
 - the geographic coverage of the analysis (e.g. by state / territory or smaller area);
 - the price path constraint that will be used to frame the ARRs, including the allowed rate of change and duration;
 - price structures (e.g. a single price structure across jurisdictions);
 - the control periods (e.g. one to two years);
 - the term of the model (i.e. over multiple control periods);
 - the form of true-up mechanism;
 - real straight-line depreciation; and
 - cost allocation method/assumptions.
 - b) Design the revenue and asset roll forward models to calculate the ARRs over multiple control periods.
 - c) Source data inputs, such as
 - demand forecasts;
 - expenditure forecasts; and
 - asset classes and asset lives.



- d) Decide model inputs / scenarios, including:
 - rate of return parameters; and
 - inflation.
- e) Determine outputs, for example:
 - RAB, rolled forward by year;
 - ARRs; and
 - Price path, including after any constrained transition period.
- f) Develop scenarios of the material parameters and choices using sensitivity analysis.
- 5. For clarity, we do not expect it will be necessary at this stage to address in detail:
 - a) service classification;
 - b) service standards;
 - c) control mechanism and revenue adjustments (e.g. cost pass through and contingent project mechanisms);
 - d) incentive schemes;
 - e) capitalization policy; and
 - f) contributions policy.
- 6. Develop modelling governance and implementation approach (who, how, when, budget, model documentation, etc.)
- 7. Develop reports:
 - a) interim reports to senior officials; and
 - b) final report to Ministers.

A strategic decision is required about whether jurisdictions would also want to analyze the BBM for Scenarios 2 and 3, in particular the price implications of moving from a government cost of borrowing to a benchmark commercial rate of return.

Appendix A – Setting the Initial RAB

This appendix sets out a description of, and experience with, approaches for setting the initial RAB value⁶⁵ for regulated industries that, like HV road services, possess a high level of market power: electricity transmission and distribution; gas transmission and distribution; and urban and rural water.

There is an extensive literature on the determination of the initial RAB. This appendix has drawn heavily on a 2006 report prepared by NERA Economic Consulting and PriceWaterhouseCoopers⁶⁶. Unless otherwise stated, the appendix in this section draws on that paper, and reference details can be found in this report.

The following approaches are discussed:

- a. deprival value;
- b. optimised deprival value;
- c. optimised depreciated replacement cost;
- d. line-in-the-sand (economic value);
- e. historic cost:
 - a. depreciated historic cost;
 - b. depreciated actual cost.
- f. valuation based on recent transactions.

We did not find any example of an initial RAB being set at zero, or at a very low level, due to users having paid for all or most capital in periods before the reform.

Deprival Value

Deprival value represents the opportunity cost incurred if an entity were to be deprived of the service potential, or the future economic benefit, of the assets. The deprival value is typically defined as being the lesser of:

1. optimised depreciated replacement cost (ODRC); and

the economic value of the asset which is calculated as the maximum of:

- a. the net present value of the future cash flows; and
- b. the net realisable value from selling the assets for their scrap value.

 $^{^{65}}$ Also called the Initial Capital Base in the National Gas Rules.

⁶⁶ Pg 1 Initial Value of Regulatory Assets - the Australian Experience, Report for Orion and Powerco, NERA Economic Consulting, Price Waterhouse Coopers, 6 December 2009

There are a few cases in Australian regulatory experience where Deprival Value has been used explicitly (see Table 9). In practice, in most cases, Deprival Value is not explicitly used.

Table 9 - Australian Regulated businesses where initial RAB applied Deprival Value	•
method	

Type of Business	Name of Business	Initial RAB
Water Businesses	South Australia Gladstone Area Water Board	Explicitly employed the deprival value concept which resulted in an ODRC valuation being adopted to determine initial RAB.
	Australian Capital Territory	Explicitly employed the deprival value concept economic valuation (based on existing prices).

Optimised Deprival Value

Optimised deprival value is a variation of deprival value and has been defined as being the lesser of:

- ODRC; and
- the economic replacement value (ERV) of the asset, which is defined as "the minimum cost of replacing the asset with a more economic alternative which still achieves the same result, depreciated based on the proportion of economic life remaining".

Optimised deprival value differs from deprival value in that it seeks to emulate the situation whereby the same service potential could be provided at lower cost through using an alternative technology.

Optimised deprival value has had limited application in Australia. It was adopted in the case of Western Power (Transmission and Distribution assets). The application of ERV concept in this case resulted in the value of Western Power's assets being ascribed a value that was just 0.5 per cent lower than the ODRC.

Optimised Depreciated Replacement Cost

ODRC⁶⁷ is a forward-looking cost based valuation method that is said to emulate how an asset value would be set in a workably competitive market. Economic interpretations of ODRC⁶⁸ include that it:

⁶⁷ Also some time called Depreciated Optimised Replacement Cost (DORC)

⁶⁸ ACCC, Draft Statement of Principles for the Regulation of Transmission revenues, 27 May 1999, p39



- is the valuation methodology that would be 'consistent with the price charged by an efficient new entrant into an industry, and so it is consistent with the price that would prevail in the industry in the long run equilibrium'; and
- represents the price that a firm with a certain service requirement would pay for existing assets in preference to replicating the assets.

In Australian regulatory practice⁶⁹, there are two steps in calculating the ODRC value:

- Step 1 estimate the cost of replacing the existing asset with an optimally configured (and sized) new asset that is constructed using modern engineering equivalent materials (the optimised replacement cost (ORC)); and
- Step 2 account for differences in the service potential and costs of operating the existing asset and the optimised asset by 'depreciating' the ORC on either a straight-line basis or on a net present value basis.

The ODRC method is considered by most economists to produce prices that are consistent with outcomes expected in a workably competitive market and that do not include monopoly rent. The ODRC method has been accepted by Australian Courts the Supreme Court of Western Australia in a decision on a review of the regulatory decision as to the initial asset value for the Dampier to Bunbury gas pipeline found:

The expert evidence indicates that an Depreciated Optimised Replacement Cost valuation will usually provide a good proxy for the price that a pipeline would realise had the owner faced workable competition at the time of its sale.⁷⁰

However, the economic justification of the ODRC method has been criticised. Johnston⁷¹ and others⁷² have argued that ODRC valuations may inflate asset book values (relative to either historical cost or market realisable value) and hence to increasing the regulated tariff stream; and that governments, have sought justified this method to maximise the proceeds from infrastructure privatisations.

ODRC has been widely used in Australia to set the initial RAB either:

a. directly (i.e. without adjustment) - see Table 10; or

⁶⁹ The theoretically correct method for calculating ODRC (but which is not applied in practice in Australia) is by 1. taking: the net present value (NPV) of the future (negative) cash flows associated with buying, operating and maintaining a new asset that is capable of providing a specified service; and 2. then deducting: the NPV of the cash flows associated with maintaining, operating (most likely, at a higher cost as compared with a new asset) and then eventually replacing with new (as and when necessary) an existing asset that is capable of providing the same specified service potential as the new asset described above.

⁷⁰ (para 64 Re: Dr Ken Michael Am; ex parte Epic Energy (WA) Nominees Pty Ltd& Anor [2002] WASCA 231 (23 August 2002).

⁷¹ Asset Valuation and Regulation of Energy Infrastructure, Tariffs in Australia: The Use and Deficiencies of DORC David Johnstone, Department of Accounting and Finance, University of Wollongong, May 23, 2001

⁷² The Business Council Australia and other user groups.



b. following adjustment - see Table 11 below

Table 10 – Australian regulated business where initial RAB Value was based on unadjusted ODRC method

Type of Business	Name of Business
Electricity Transmission	 TransGrid (NSW) Powerlink (Qld) ElectraNet (SA) SP AusNet (Vic) TransEnd (Tas)
Electricity Distribution	 ETSA Utilities (now SA Power Networks)(SA) ACTEW AGL (ACT) EnergyAustralia (NSW) Integral (now Endeavour Energy) (NSW) Country Energy (now Essential Energy) (NSW) Aurora (now TasNetworks) (Tas) Energex (Qld) Ergon Energy (Qld)
Gas Transmission	 Moomba to Sydney Pipeline Moomba to Adelaide Pipeline Amadeus Basin to Darwin Pipeline Roma to Brisbane Pipeline
Gas Distribution	 MultiNet (Vic) Envestra (SA) ActewAGL Gas Distribution Network (ACT) Envestra (QLD) Algas (QLD)

Table 11 sets out Australian regulated business where initial RAB Value was based on adjusted ODRC. In one case, the adjustment to the ODRC value was to recognise government policy on end-user pricing. In the other case, the downward adjustment reflected the exercise of the regulator's discretion to balance the interests of the asset owner with the interest of customers.

Table 11 - Australian regulat	ed busines	s where	initial RAB	Value based of	on adjusted
ODRC method					

Type of Business	Business	Description
Electricity Distribution	United Energy CitiPower Powercor Solaris (Now Jemena) Eastern Energy (now AusNet Services)	In Victoria, the initial RABs for electricity distribution business and were determined by adjusting the ODRC asset values up and down by equal amounts in total across five distribution networks to enable more uniformity of pricing across urban and rural areas of Victoria.



a	rri	er	Sv	vier	
\sim	nc	udti	ina		

Gas Distribution	AGL (Now Jemena) NSW gas distribution systems	IPART approved an initial capital base that was 9 per cent lower than the value proposed by the pipeline owner, AGL, and 25 per cent lower than the ODRC.
		IPART simply stated that it would result in real price reductions for contract customers and would have no adverse effect on the financial viability of the pipe.

Line-in-the-sand

Under this approach, the initial value of the asset base is set to be consistent with maintaining the prevailing prices, revenues or returns into the future. If it is used to maintain the prevailing level of prices or revenues, then it is consistent with using the 'economic value limb' of the deprival value method.

Line-in-the-sand valuation has been widely used in the water sector (see Table 12). The rationale for adopting the line-in-the-sand approach in the water industry has been said to be:

> ... to help create a smooth, but longer, transition, from political to commercially established prices, and to do so with the least community opposition.

> often in the water sector in Australia the replacement costs of infrastructure were far higher than the recoverable amount.

[A political problem arose with reform because] unwinding of cross subsidisation would impose higher costs on particular customer groups, and in part because requiring commercial returns on capital increased costs for all categories of customers. In both cases, there is potential for change to be fiercely disputed by those affected.73

Table 12 - Australian regulated	business where	initial RAB	Value was l	based on	ı line-
in-the-sand approach.					

Type of Business	Name of Business	Description
Water Businesses	17 Victorian rural and regional water	Values assumed for most businesses were based on the expected 2004 returns.
	businesses	In those cases, where the ESC concluded that there was a risk to the businesses' financial viability, a higher value was adopted by the Minister.
	Sydney Catchment Area	Asset base set by reference to 1996 tariffs.
	ACTEW Water and Sewerage	Economic value based on existing prices.

⁷³ Drawing a Line in the Sand: Valuing Regulated Assets of the Australian Water Industry, Malcolm Abbott, Bruce Cohen, Economic Papers, Volume 36, Issue 1, March 2017

Type of Business	Name of Business	Description
Gas Transmission	Mid-West and South-West gas pipeline	AlintaGas proposed the adoption of an initial capital base that was 25 per cent lower than would be derived if the ODRC methodology were employed.
		The rationale stemmed from AlintaGas' desire to ensure that the resultant pipeline charges were consistent with the retail gas prices that were expected to prevail during the control period.
Gas Distribution	Stratus (now AGN) Westar (now Ausnet Services)	ODRC value was written down to ensure consistency with policy of Victoria Government that no customer should face higher prices when retail contestability introduced.
	Mid-west and South-west gas distribution systems (AlintaGas)	Asset owner proposed (and regulator accepted) a line-in-the- sand valuation (expressed as based on the economic value limb of the deprival value method).

A potential problem with the line-in-the-sand approach is that setting an initial asset value that 'locks in' previous prices, revenues or returns may have the effect of 'locking in' an inappropriate asset valuation, i.e. one that reflects monopoly returns calculated against an objective standard, or one that is inappropriately low given the historical circumstances or future cash flow needs of the organisation. For this reason, line-in-the-sand approaches should be applied in conjunction with a broader assessment of valuation methods and factors.

Detailed application of line-in-the-sand approach

It is useful to set out further detail of the way in which the initial RAB values for the Victorian and NSW water business were calculated. This is set out in Box 17 and 18.

Box 17 - Application of 'Line in-the-sand' approach - Victorian Water businesses

To calculate the value of assets for the Victorian water business as at 1 July 2004, the Essential Services Commission (ESC) used a line-in-the-sand approach which entailed 'reverse engineering' the building block framework to determine the value of assets that would be consistent with a variety of return and pricing assumptions including:

- Based on the ESC's analysis assuming each business continues to earn the returns observed in 2004-05; and
- assuming a 0-6 per cent change in current prices charged by each business in the future.

The Minister of Water approved values for each of the 17 businesses that were calculated as follows:

• the values of eleven businesses were set so as to maintain the 2004-5 returns into the future;



- the values of three businesses were calculated to maintain in the future the prices prevailing at the time;
- the values of two businesses were calculated to generate a six per cent increase in the prices compared to those prevailing at the time the analysis was undertaken; and
- the value of one business was calculated to generate a 4 per cent increase in prices compared to the prices prevailing at the time the analysis was undertaken.

Box 18 - Application of line-in-the-sand approach - Sydney Catchment Authority

The approach to asset valuation established IPART in its price determination for the Sydney Catchment Authority over the period 2000-2005 was based on the economic value indicated by the previous price determination in 1996.

IPART relied upon PricewaterhouseCoopers (PwC) assessment of the different methods for calculating the transfer values of Sydney Water Authority's assets. PwC considered a range of asset values based on different methodologies, such as depreciated actual cost and DORC. In recommending the adoption of the economic value approach, PwC applied the following selection criteria:

- minimise the accounting and taxation adjustments which may be required on transfer and in the future
- implications for the treatment of the remaining assets within Sydney Water
- achieving an acceptable commercial rate of return on the assets
- recovery of costs through revenue
- supporting a level of debt which is reflective of an appropriate capital structure for the Catchment Authority's business, and one which satisfies a credit rating of around 'A'

Historical costs

There are two variations of historical cost that could be applied: depreciated historical cost and depreciated actual cost.

Depreciated Historical Cost

In the depreciated historic cost approach, the initial value of the asset base is calculated by commencing with the original capital cost of the asset(s) and scaling this down according to the extent its economic life that has passed. Such a value may reflect the value that had been assigned to the relevant assets for financial accounting purposes, once an adjustment had been made for revaluations of assets. While this method has been discussed it has not to our knowledge been used in Australia for setting the initial RAB of a regulated business. We have not considered this option further.

Depreciated Actual Cost

Depreciated actual cost is the original capital cost of the asset(s) less the accumulated depreciation that had been charged to users previously. This method is an option for the initial capital base that was provided for in the Australian National Gas Code.⁷⁴

This method requires consideration of actual (rather than notional) past capital recovery reflecting the idea that the past capital costs should be based on accounting for the costs 'already paid for' by users.

This approach is proposed on equity grounds and may result in:

- a value that is less than the ODRC in circumstances where a significant amount of the asset has been recovered from users; and
- a value that is higher than the ODRC in circumstances where there has been an under recovery of depreciation from users

In most situations, calculating actual past capital recovery to determine the implied residual value for an asset is difficult because of the lack of historical information and the need to make assumptions about past pricing, costs and discount rates. For this reason, there has been limited use of the depreciated actual cost Method. If, however, an asset had not been in existence for an extended period and had set cost-based prices, then obtaining an accurate estimate of the residual value may be a feasible task.

Examples where this method has been used to determine the initial RAB were in the case of the Central West Pipeline and the Goldfields Gas Pipeline where the calculation of the RAB reflected the level of economic depreciation previously recovered by the pipeline owner.

We consider that using this method would be very difficult to apply for setting the initial RAB because the assets have been in place for a long period and the likely lack of historical information.

Valuation based on recent transactions

A valuation based on the price recently paid for assets is another alternative that has been recognised in Australia. This approach would not be applicable for roads services.

⁷⁴ Section 8.10(f) National Gas Code

Appendix B – Economic efficiency considerations for alternative depreciation schedules

This appendix examines four economic efficiency principles for considering why alternative methods than straight-line depreciation could be adopted:

- Price stability.
- Potential introduction of congestion pricing.
- Flexibility to promotes efficient growth in demand for services.
- Managing risk of technology change and competition.

These principles concern the relationship between depreciation and HV changes through time and by location.

Price stability

Straight-line depreciation will promote price stability where the profile of capex and opex is reasonably stable over time because, as noted above, depreciation charges are calculated evenly throughout the useful life of assets.

However, if there was for example a large increase in capital expenditures that is known to be temporary then straight-line depreciation may result in prices rising initially and then falling.

As discussed earlier, it could be argued that having regard to HV users' interest in reasonable stable and predictable prices may be a proper economic consideration. In this case, there could be an economic argument to change the depreciation schedule to smooth out the impact of fluctuation in prices.

Potential introduction of congestion pricing

As noted in section 2.7, the Harper ⁷⁵ and Henry⁷⁶ reviews recommended that reform of road pricing and provision should be a priority for Australian government's and noted technologies are available that allow for more widespread application of cost-reflective pricing in roads, considering location, time and congestion.

⁷⁵ Pg 318 Competition Policy Review, Final Report, March 2015

⁷⁶ Australia Future Tax System, December 2009, Recommendation 61

Congestion pricing is a form of 'peak load pricing' that if adopted will affect the total revenues recovered from HV charges and may cause a need to review the depreciation method.

This is a complex topic and we make only some brief observations.

Economic literature on the optimal depreciation policy for durable assets developed by the economist William Baumol suggests that some or all of the fixed costs of road services should be recovered during the times, and in the locations, where congestion charges are levied, rather than on a predictable basis over time (as under any form of accounting based depreciation method).

Baumol puts the idea simply:

"The irrationality of a depreciation policy that demands the same contribution toward the cost of an asset in periods of heavy and of light usage is not too dissimilar in character from the curious commuter discounts which, in effect, make it cheapest to travel through tunnels or over bridges precisely at the times of day when they are most crowded. Both practices simply serve to compound the congestion and contribute nothing toward increased utilization at times when unused capacity is available." ⁷⁷

This idea is also consistent with the intuition of politically acceptable congestion pricing which is that it should not result in an overall increase in road charges (only a change in the incidence of charges).

The level of transparency that can be created through regulatory accounting for regulatory charges may assist in improving acceptability of congestion charging because would be possible to demonstrate that users are still only paying for road assets once.

If the level of congestion is reasonably constant over time then higher congestion charge revenue can be collected at congested times with lower offsetting revenue at uncongested periods, in effect reducing the amount of fixed costs recovered through variable charges. However, if the incidence of congestion changes (say) increases over time, then this may have implications for the choice of depreciation schedule. This would require detailed investigation which is beyond the scope of this report.

A further issue to consider is the theoretical risk that where a service provider can engage in peak-load pricing

⁷⁷ Baumol, W (1971), 'Optimal Depreciation Policy: Pricing the Products of Durable Assets', The Bell Journal Economics and Management Science, Vol 2, pp.645. A recovery of fixed cost only arises in non-congested times when the intensity of use of the asset causes its service potential to decline, in which case the value of the reduction in service potential in the period should be reflected in depreciation (this cost is referred to as the 'user cost'). In contrast, any decline in service potential that is unrelated to the intensity of use of the asset should have no effect on the timing of the recovery of fixed costs.



that it might have an incentive to create congestion in order to reap the benefits of the peak charges. There would need to be appropriate arrangements in place to address this risk. Promoting efficient growth in demand?

The National Gas Rules include a provision that a regulated service provider can propose a depreciation schedule for an asset or group of assets that enables tariffs to vary, over time, in a way that promotes 'efficient growth in the market for reference services'.

One reason for this provision is to allow newly constructed gas pipelines to set a 'back ended' depreciation schedule to produce a lower tariff and encourage higher utilisation in the early years of the pipeline life. This may promote dynamically efficient where the lower tariff stimulates increased use of the pipeline.

In principle, there may be economic benefits in implementing a depreciation schedule that takes account of the growth in the market where there is a significant level of locational disaggregation of tariffs away from postage stamp pricing.

For example, say that a jurisdiction decided to construct a new road, the road was to have its own locational charge, and the initial demand was low, but was projected to grow. If there is sufficient responsiveness of demand to the HV charge then it may be dynamically efficient in this case to backend the depreciation charge to stimulate faster growth in demand.

Issues that would need to be considered include:

- Whether the road industry, government and users are 'ready' for such a level of flexibility and innovation in the structure of charges
- Whether there are any practical applications of such an approach? For example, are there instances where building or undertaking major upgrades of new roads where setting lower charges initially may stimulate growth?

Should such a provision be included in the depreciation principles for the HV asset base? It is arguably not necessary to include such a provision provided it is clear the regulators role includes promote efficiency. We understand that this position was included in the gas rules to remove doubt that this approach could be applied.

Accelerated depreciation - potential for technology change and competition

In the long term the roads used to provide HV services could conceivably be subject to technology, market or competitive changes.

The electricity network businesses and policy makers are considering whether the industry is increasingly at risk of technological disruption from such technologies as solar PV and battery storage. The future impacts are uncertain but they may in future



result in shorten economic lives of assets and may make it more difficult the recover depreciation due to increase competition.

The Australian Energy Regulator has stated that it recognise the development of disruptive technologies in the Australian energy sector may create some non-systematic risk to the cash flows of energy network businesses and that these impacts be more appropriately compensated through regulated revenues including accelerated depreciation.

The Commerce Commission of New Zealand (CCNZ) recently approved a 15% reduction to remaining lives for all electricity distribution assets as a precautionary measure to respond to a changing energy landscape. ⁷⁸

⁷⁸ <u>https://www.comcom.govt.nz/dmsdocument/14332</u>

Appendix C – Options for full and partial market expenditure

This appendix: distinguishes between 'full market expenditure' and 'partial market expenditure' approaches to developing a FLCB for HV charges; discusses the various ways in which a 'full market expenditure' approach could be applied; and recommends an approach for the prototype HV revenue model.

'Partial market expenditure' approach

A 'partial market expenditure' approach would involve developing a standalone HV cost base and a standalone HV ARR, to develop HV charges. This approach would be applied independent of, and separate to any future development of any cost base, ARR and charges for LV services. This is illustrated in Figure C1.

Figure C1 - 'Partial market' approach



As noted previously roads are designed, built, maintained, and financed through an integrated process to provide services to both HV and LV. Following discussions with DIRD and the NTC, we have based our advice on a 'full market expenditure' approach.

Options for a 'full market expenditure' approach

There are various ways in which a 'full market expenditure' approach could be applied. These are discussed below.

Our recommended option (Option 4) is to develop an HV RAB as part of the current reforms and develop a LV RAB at the time any future LV reforms are undertaken; and allocate shared expenditure between HV and LV; and then to develop a standalone HV cost base and HV ARR, to develop HV charges.

In time, it would be possible to develop a standalone LV cost base and LV ARR, as part of any future LV market reform. This approach is appropriate where it is possible to develop a HV initial RAB separately from any future LV initial RAB, without needing to calculate and allocate the total RAB. This is illustrated in Figure C2.





Figure C2 - Option 4 - Separate HV RAB with the allocation of shared expenditure

The benefit of this option for the current HV reforms is that it starts from an initial HV RAB and allocates only shared expenditure and initially only develops a HV cost base to develop a standalone HV ARR that can be used to develop HV prices and charges.

Recommendation

For the prototype HV revenue model we recommend developing an initial HV RAB and allocating shared expenditure between HV and LV; and developing a standalone HV cost base and HV ARR, to develop HV charges.

This recommendation is consistent with using the line-in-the-sand approach to set the initial HV RAB, which does not require the calculation of a LV RAB and is therefore dependent on adopting this approach to setting the initial RAB.

Options considered

There are various ways in which a 'full market expenditure' approach could be applied.

Option 1 involves developing a full cost base and a full ARR for all (i.e. HV and LV) services. The ARR could then be allocated between HV and LV services to develop HV charges (and potentially, in time, LV charges). This is illustrated in Figure C3.

Figure C3 - Option 1 - 'Full market' approach with revenue allocation



A shortcoming of this approach for the current HV reforms is that it would be necessary to develop a full cost base and a full ARR – covering both HV and LV – to develop charges just for HV services.

Option 2 is to develop a full cost base and then to allocate shares between HV and LV services to develop HV charges (and, in time, potentially LV charges). This is illustrated in Figure C4.







Although this would result in a standalone HV ARR, it would not address the shortcoming of Option 1 of needing to develop a full cost base covering both HV and LV services.

Option 3 is to allocate the full RAB and shared expenditure between HV and LV and then to develop a standalone HV cost base and HV ARR, to develop HV prices and charges. In time, it would also be possible to develop a standalone LV cost base and LV ARR, if there is a desire to develop LV prices and charges. This approach could be appropriate where the best method for setting the initial RAB is to calculate a total RAB for both LV and HV services. This is illustrated in Figure C5.





The benefit of option 3 for the current HV reforms is that it starts from the full (HV and LV) RAB, allocates only shared expenditure and initially only develops a HV cost base to develop a standalone HV ARR that can be used to develop HV prices and charges.

Option 4 (detailed above) would be to develop an HV RAB as part of the current reforms and develop a LV RAB at the time LV reforms are undertaken; and allocate shared expenditure between HV and LV; and then to develop a standalone HV cost base and HV ARR, to develop HV charges. In time, it would be possible to develop a standalone LV cost base and LV ARR, as part of any future LV market reform. This approach is appropriate where it is possible to develop a HV initial RAB separately from any future LV initial RAB, without needing to calculate and allocate the total RAB.

As with Option 3, the benefit of Option 4 for the current HV reforms is that it starts from an HV initial RAB and allocates only shared expenditure and initially only develops a HV cost base to develop a standalone HV ARR that can be used to develop HV prices and charges.

Appendix D – Emerging issues in BBM Design: 'Totex'

There are emerging concerns in regulatory theory and practice that the approach of allowing a rate of return to be earned on capex but not on opex may create incentives (in the case of HV reform) for a road service provider to:

- bias decision making towards capital solutions rather than operating solutions (which is productively inefficient); and
- reclassify expenditure from opex to capex (which is allocatively inefficient, resulting in users paying more than is required).

Ofgem (the UK energy regulator) and Ofwat (the UK Water regulator) have recently moved away from using accounting concepts for opex and capex to address these concerns.

They have changed to an approach that accounts for 'Totex', which involves the recovery of expenditure based on an arbitrary split between immediate recovery (the "fast pot") and recovery over time (the "slow pot"). This approach has also changed the design of incentive schemes.

The arbitrary split between the fast pot and slow pot means that a regulated business is unable to undertake actions which shift expenditure from opex and capex

We are aware of interest in Australian energy regulation in moving to a Totex assessment approach. We suggest monitoring these regulatory developments if the BBM approach is implemented for HV services.